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OF THE

ACADEMY OF NATURAL SCIENCES

PHILADELPHIA.

1867.

PHILADELPHIA
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PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

1867.

Jan. 1*st.*

MR. VAUX, Vice-President, in the Chair.

Twenty-nine members present.

The following deaths were announced:

Edward F. Sanderson, Esq., Member; and Rev. Stephen Elliott, of Georgia, and Prof. Geo. W. Featherstonhaugh, of Havre, France, Correspondents.

Jan. 8*th.*

The President, DR. HAYS, in the Chair.

Thirty-six members present.

Jan. 15*th.*

MR. VAUX, Vice-President, in the Chair.

Twenty-nine members present.

Jan. 22*d.*

MR. VAUX, Vice-President, in the Chair.

Thirty-four members present.

Jan. 29*th.*

The President, DR. HAYS, in the Chair.

Twenty-seven members present.

Dr. H. C. Wood tendered his resignation as Recording Secretary.

The following gentlemen were elected members:

J. E. Farnum, W. H. Stevens, Edw. B. Edwards, Dr. James Levick, Charles Gibbons, John B. Austin, Wm. S. Baird, Edwin Greble, Walter B. Smith, C. F. Haseltine and Wilson M. Jenkins.

The following were elected correspondents:

Prof. O. C. Marsh, New Haven, Conn., and Prof. Wm. H. Brewer, New Haven, Conn.

Pursuant to the By-Laws, an election of members of the Standing Committees for the ensuing year was to be held, but was deferred until the next meeting for business.

On favorable report of the committee the following paper was ordered to be published:

On a new genus in HOMOPTERA,—(Section Monomera.)

BY HENRY SHIMER, M. D.

Characters for a supposed new Family.

DACTYLOSPHÆRIDÆ, Shimer.

Wings four, carried flat on the back in repose.

Antennæ few, jointed.

Tarsi composed of one joint, terminated by two claws, and from two to six *digituli*.*

Honey-tubes none; otherwise resembling *Aphidæ*.

DACTYLOSPHÆRA. New genus.†

Male—Anterior wing with one one-branched discoidal, and a stigmatic nervure; posterior wing with no discoidal.

Female—Apterous, body thick, clumsy, subellipsoidal.

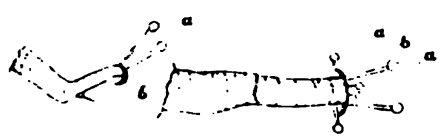
Common Characters—Antennæ 3–4 jointed. Tarsi, six digituli. Promuscis sheath four-jointed,

DACTYLOSPHÆRA GLOBOSUM, n. sp.

Inhabits galls on the Pig-nut Hickory, (Carya glabra.)

Male—Abdomen and prothorax orange-yellow; mesothorax, head and eyes, blackish; legs and antennæ dark cinereous. Wings hyaline, broad, somewhat overlapping as they lie horizontally on the back. Anterior wing, even-

* I suggest this name, *digituli*, from the Latin *digitulus*, a small finger or toe, for these remarkable organs; it appears to me appropriate, because they are arranged around the foot somewhat like the toes of an animal.

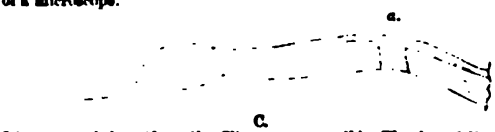


A. B.

A.—a side view of the foot of *D? vitifoliæ* magnified; *a*, the two *digituli*; *b*, the claws.

B.—a vertical view of the foot of *Dactylosphæra globosum*, from above, magnified; *a*, the six *digituli*; *b*, the claws, as they may be seen while the insect attempts to walk on the glass plate of a microscope.

D.



C.

C.—the promuscis sheath of *D. globosum*.

D.—Upper and under wing of *Dactylosphæra? vitifoliæ* greatly magnified. This figure was drawn from the only specimen I have remaining, (from the Clinton grape gall.) The dotted lines in the anterior wing are what I saw under the microscope in the recent specimen; the shading between the costal and subcostal nerves represents a hazy appearance, as I saw it under the microscope. The vein in the posterior wing is very obscure, but I saw it with an excellent simple lens.

† From *δακτυλος*, a finger or toe, and *σφαῖρα*, a globe, on account of the slender globe-ended appendages of the tarsi,—*digituli*.

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those in the small galls above alluded to, and I could detect no difference: both kinds existed on the same leaves frequently, and sometimes on different leaves of the same tree; other trees have numerous galls all of the small size; in none of these small galls, after the most diligent search, have I ever been able to find a winged male. The conclusion that I have arrived at is that the galls that produce the winged males develope to a larger size, so as to make room for the coming winged inhabitant, on the great principle or law of nature that provides for the wants of every creature, often in a mysterious manner. These small subglobular galls could not conveniently accommodate the winged males. The male producing grape leaf gall, also, is very long and well developed, so far as my limited observations have extended, while galls containing fertile females are variable from large to even quite small. From my examinations of these Hickory-leaf gall insects, I never saw the males support themselves by their wings, although they attempted flight when dropped properly from the point of a needle; the atmospheric temperature then was moderately cool, which may account for their weakness. When they attempt to fly, the hook of the posterior wing clasps the thickened posterior border of the anterior wing, but not when at rest. The male of the grape leaf (*vitifoliæ*) gall insect also thus made several ineffectual attempts at flight, but was not able to support its body; how this might be in a very warm sunny day I did not have the privilege of determining.

During my microscopic examinations I became convinced that the apparent enlargement of the posterior border of the anterior wing of these insects, is not a developement of a nervure or a mere tumefaction of the border, but a rolling up of the margin like a scroll, which much more admirably fits it for a permanent retaining point for the hook on the anterior margin of the posterior wing.

To make a thorough examination of the feet and their appendages, the living insect is the only material from which it can be satisfactorily done. The *two* claws, as in the case of the "grape leaf louse," can be easily seen as the insect attempts to walk on the glass plate. The tarsi of the larva and female only have two conspicuous digituli, but the male, as it approaches the imago state, develops six; these I observed in the pupa, being the most convenient state for the examination of these organs; those in the middle, between the long or principal pair, are not always so conspicuous, but may be plainly seen under proper circumstances; more frequently they appear as one short stub-like spine.

The knobs on the extremities of the principal digituli, over the claws, are globular, while those on the middle and lateral ones are obovoid and comparatively small.

The legs, feet, etc., of the male imago are much longer than in any other state, hence they appear to be the best material for satisfactory examination, regarding the problem of one or two joints for the tarsi. While the insect was walking slowly under the microscope, I beheld, in a vertical direction, that the tarsi are composed of at least three rings or segments, none of which presented a movable joint; I then crushed the abdomen, but did not injure the thorax: by this means I brought some of the legs on the side, so that the joints moved in a plane parallel with the glass plate; this also had the advantage of confining the insect to the spot, and, as I did not injure the thorax, I had a fair opportunity of examining the tarsi for a long time, with the advantage of such motion as I desired while the insect struggled for freedom; this view of the tarsi demonstrates that they are composed of four rings soldered together, none of them gave the slightest joint-like motion; the upper ring is the most plainly distinct from the succeeding one; on the under side of the foot I beheld some constriction, but on the sides and above there is none: I observed this with great care, but saw no motion, the bending of the foot being confined entirely to the articulation of the tarsus with the tibia. I then, by way of comparison, examined, under similar circumstances,

[Jan.

the foot of a species of *Aphis*, abundant on the apple trees, and saw it composed of the same number of rings; the upper one at its union with the succeeding showed some constriction, as seen either from *above* or from the side view; moreover the motion of a joint was very satisfactorily seen, the insect sometimes bending it alone, at other times in conjunction with the tibio-tarsal joint.

Now, in view of these facts, I can see no reason for claiming two joints for the tarsi of this insect. It would be as reasonable to suppose that each primary ring was a joint, and then we would have four, which, with the digituli that might be the representatives of another joint, give five undeveloped joints—joints in embryo—the highest number in the more perfect *Insectians;* but in the case of this and other species of this family, which I have observed, all are soldered together. By extending my examinations to the tibia I found it composed of about 50 similar primary rings, each one of which was plainly widened from above downward, thus agreeing in the general structural anatomy with the tarsus. This same primary annulated structure I beheld in the antennæ of these insects, also in several species of Aphidæ to which I extended my observations by way of comparison.

Frequently the distal or wide end of these primary rings is prolonged into spines, &c., more or less numerous according to the species of insect. These observations give us a view of the true primary anatomical structure of the long members of insects, for this annulated structure very probably exists in the long members of all insects, although not so readily detected, in many cases, as in the translucent limbs of these insects. Furthermore, these observations lead us to be careful about pronouncing upon the number of joints in the tarsi. To designate each one of these rings as a true joint would lead us at once into inconsistencies, for any anatomist could not presume that the tibia is composed of 50 joints, or the antennæ of this insect, and many species of the *Aphidæ*, of perhaps hundreds; hence, where we behold in the tarsi precisely the same structure, we are no more justifiable in ascribing to it 4 or 5 joints, or even *two*, without beholding the motion of a joint, or the usual constriction. In view of these facts I have made extended and careful observations on the tarsi of these insects, and have become entirely satisfied that there is but *one* joint. These are my reasons for believing that these insects belong to a new family between the *Aphidæ* and *Coccidæ*.

The promuscis sheath of this insect I examined under more favorable conditions than that of the "grape leaf louse," and clearly saw four joints; and if, as I believed, there are two in close proximity, as shown in the magnified sketch at *a*, fig. C, on page 1, there are five joints, while in the latter I did not succeed in distinguishing more than three; perhaps with proper material the same arrangement may be discovered in the latter as in the former species. In *D. globosum* I had an abundance of male pupæ and winged imagos for examination, while in the *D? vitifoliæ* I was chiefly confined to females and larvæ. The bundle of setæ I could not separate, although I made numerous examinations, with the living insect on its back, for the purpose of ascertaining positively. I often saw the insect take hold of it by grasping it between the claws and the foot, pulling and bending it in various directions, sometimes seizing it with two feet and pulling in opposite directions, yet I could not determine more than one piece.

DACTYLOSPHÆRA? VITIFOLIÆ * (The "Grape leaf louse.")

Pemphigus vitifoliæ, Fitch, 1st and 2d Reports, p. 158. Walsh, Practical Entomologist, vol. i., p. 111.

* Not wishing to multiply genera unnecessarily, I have not constructed a new genus for this insect, but my convictions are that there are characters that probably warrant its separation from *Dactylosphæra*, according to custom. The stigmatic nervure was absent in all the specimens I saw, but upon close examination with a microscope of moderate power, in one specimen I imagined that I saw part of a faint dark line in one wing, where it might be sought for. The branch of

Inhabits galls on the grape leaf, tendrils and vine.

Male—Body moderately slender; abdomen sharply taper-pointed, with a few scattering hairs at the extremity; head short; neck thick. Body, head, legs, and antennæ light yellow, the two latter palest; a broad dark band encircling the middle of the thorax. Wings membranaceous, hyaline; in repose, somewhat overlapping, rather wide or diverging behind the extremeties; in the only entirely perfect specimen observed were slightly curved upwards. Anterior wing widest in the middle, subobovate; posterior margin one regular curve or arc of a circle from the base to the outer extremity; apex completely rounded and comparatively broader than I have observed of our common *Aphidæ;* anterior margin irregularly convex, the greatest convexity being somewhat nearer the basal extremity, where it is considerably rounded forward; a small, inconspicuous costal, and a yellowish strong subcostal nerve; one dark discoidal springing from about the basal third or fourth of the subcostal and shading off or becoming lost in the membrane before reaching the border; outlines of these nervures rather hazy, obscure, not sharply defined;† a long, very obscure branch passes longitudinally from near the middle of the discoidal, in some specimens scarcely, if at all, perceptible; part of the costal space near the base, and an imperfect, undefined stigma, light fulvous. Posterior wing, small, narrow; no discoidal nerve; subcostal scarcely perceptible, somewhat near the costal. Tibiæ and tarsi with a few hairs or spines, a somewhat prominent one beneath the foot near the joint. The digituli, with their conspicuously globular extremities, arise from the extremity of the tarsi, just above the claws, and project beyond the long subcylindrical tarsi about one-half their length, and about four times the apparent length of the comparatively thick, much curved, light horn-colored claws, as held when walking: these slender, almost hair-like appendages or fingers are smooth, slightly curved downward, not tapering to the extremity, terminates in an abrupt, complete globe of about two or three times the diameter of the pedicel. Antennæ long compared with those of the female, but moderate when compared with those of some Aphidæ; pale whitish-yellow, inserted before the eyes, they usually appear three-jointed, (and will be thus considered when examining with a good pocket lens, and more especially in the dried specimen, where we have not the advantages of motion under the microscope, so invaluable in the living specimen.) The extreme joint being very long, and under a higher power annulated with about 25 fine grooves, the marks of the primary rings; but in

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the discoidal is so very obscure as to be easily overlooked, and, being a microscopic character, might be rejected, but if retained we still have the generic characters differing from *Dactylosphæra*, viz: Anterior wing with one one-branched discoidal. Antennæ 3—8 jointed. Tarsi *two* digituli. In case, however, the characters given above should be sufficient to separate, generically, *vitifoliæ* from *D. globosum*, I would propose the generic name of *Viteus* for the former.

† I wish to be clearly understood regarding what I saw of these wing characters. Very probably they will not all be admitted as existing characters by closer investigation of the dry specimen. My examinations were all made in the recent state. With a good lens the discoidal nerve can be seen not as a clear, sharply defined rib, but as an obscure, hazy, margined line; the same may be said of the subcostal nerve which, however, is much plainer, the discoidal branch not observable.

With a good compound microscope, of different increasing powers, something more can be learned in the *recent* state. All the veins are in an imperfect or partially developed state; the walls of the tubes are not so completely formed as to present the sharply defined lines observable in higher developed insects, and with sufficient power to discover the primitive cells, we behold them piled up on each other great blocks of microscopic masonry—the foundations of the walls of the veins. Looking through the centre of the forming tube, the field appears more transparent, because we do not look through so great a depth of the imperfect tube walls as at the side; this central transparency of these hairy lines in the wings, furthermore, an evidence that it is a channel for the circulation of the blood. The margins and terminations of these veins appear hazy because the cells are in a loose or diffuse state. In most insects the walls of the veins are completed, hence the ribs are clearly defined. These remarks are peculiarly adapted to the *discoidal* nervure, where the cells that nature has provided for the construction of the tube of the vein are to be seen to good advantage between the membranes of the wing. The branch of the discoidal is a very evident capillary tube, with similarly imperfect walls. I saw in one wing a faint trace of a capillary stigmatic nervure in a small part of its course. The subcostal nerve of the posterior wing is in the same undeveloped condition and almost capillary—microscopic. I examined, thus, every portion of the wings of my specimens, elsewhere I saw no trace of nerves, only the uniform

one specimen I fairly succeeded in resolving this extremity into five joints, making in all really seven joints somewhat nearly equal; first joint tumid, very short; second short and thick also, but much smaller than the first, truncately rounded at the outer end, with a somewhat prominent spine projecting from the anterior margin and a solitary capillary hair of equal length; third connected with the second by a narrow pedicel; fourth slender, small: thence the joints become gradually thicker towards the last; fifth longest, about equal to the third with its pedicel; sixth shortest excepting the basal; seventh becoming obliquely tapering towards the apex, which sustains three short spines. The pedicel, between the second and third, may be a very small joint, (of which I am convinced, giving really 8 joints in all,) but of its existence I am not certain by ocular demonstration, therefore I do not give it place as a positive character. The numerous grooves in the antennæ much resemble the line of union of very short closely embracing segments soldered together, and are doubtless primary rings of embryonic development. Length to the tip of the wings about ·07 inch.

Female yellow, tumid; abdomen gradually tapering to a short point: clumsy, making little or no progress on a smooth surface, somewhat variable in size, appearing, to the naked eye, not much unlike a yellow immature grain of common purslane (*Portulaca oleracea*, L.) seed. Like the *Termite*, increasing in size and fertility as pregnancy continues; its average length being somewhere about three-hundredths of an inch; segments more conspicuous above and beneath than on the sides; the globular-ended, or knobbed hair-like digituli of the tarsi plainly seen projecting beyond all the feet about half their length, fornicate cylindraceous; also on each side of these, there is a prominent, accuminate, hair-like spine, and between them a short spine of about, or somewhat less than, half their length. Antennæ 3-jointed, transversely rugose or imperfectly annulose, nearly naked, sublinear, situated on the forehead in front of the eyes; first segment tumid or subglobose, short, of much the greatest diameter; second short, intermediate in diameter between the first and third, with a small spine anteriorly; third exceeding the first and second in length, subfusiform, the obliquely pointed apex shortly bifid; eyes small, few facets. Promuscis arising from about the anterior fifth, in a thick reclining stump-like base; sheath three-jointed (?), usually lying on the breast.

Larva somewhat depressed, elongate-elliptical, in the field of view from above; moderately active, yet slow when compared with other insects; in the field of a microscope of low power it can be examined with a good degree of satisfaction before it travels beyond the field of view; color light yellow-prasinous; feet and antennæ as in the perfect female.

Egg prolate spheroidal; length about 2½ times the width; pale greenish-white; to the naked eye visible only as a fine dust point.

Pupa of the male somewhat longer and more slender than the mature female, browner; legs longer, much more active; the short, brown, imperfect wings diverging obliquely down the sides; antennæ as in the mature female.

Gall.—The *vitifoliæ* gall always opens on the *upper* side of the leaf, while the gall of *Dactylosphæra globosum*, on the leaf of the Pig-Nut Hickory, (*Carya glabra*), always opens on the *lower* side, and both are alike in being free from any of the sugary dust, so common among the gall-producing *Aphidæ*. It is subglobular, quite rough on the outside, and of variable size, according to the age, &c., well developed galls attaining the size of a pea. They are often very numerous, almost covering the leaf, and in many cases the leaf is destroyed before the gall becomes fully developed; occasionally they are located on the

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thin cellular tissue connecting the two walls of the wing-bag. These are facts that I believe worth recording; others may receive them for what they are worth in classification. I can see here somewhat satisfactorily the same plan of neuration, in an embryonic state, as given for the genus *Dactylosphæra*, and I will not be surprised if specimens yet be found in a better state of development. The wing neuration of *Dactylosphæra* is synonymous with that of *Phylloxera*, (Proc. Ent. Society, vol. i., p. 297, fig. 8,) it is therefore upon the other characters that I found this genus.

leaf stalks, tendrils and vine itself; these latter some authors are inclined to refer to a distinct species, but as they are associated with those on the leaf, and as there is no observable anatomical difference between the egg, larva and female of these and those on the leaf (as I have shown elsewhere), it is quite inconsistent to believe that there is a specific difference. The young larva leaves the gall, usually, soon after being hatched and resorts to the tender leaf as it is expanding from the bud, fixes its location, where it feeds by puncturing the leaf and sucking the juices; this irritation causes an abnormal development of the leaf and thus produces a cup or bottle-like excrescence or gall in which the insect now developes to a mother and where she resides, laying eggs, during the remainder of her life; from 50 up to even 5000 eggs may be found with her at once, and one female may be the progenitor of many millions in one season, even 10,000,000,000,000,000, as I have shown in the *Practical Entomologist*, vol. 2, page 17. Sometimes a few of the female larvæ, from some cause, appear to remain in the gall until maturity;* at other times the galls are so closely located that two or three are blended into one irregular gall, with as many primary parents. This disposition to, in a measure, form colonies, while the coccus spirit of emigration also prevails, is another evidence that this insect forms the connecting link between the *Aphidæ* and *Coccidæ*. Much might be said regarding these galls, their enemies, &c., but they have been in a measure recorded in various publications.

HOW TO CONDUCT EXAMINATIONS.

The antennæ of these insects can easily be examined with a common botanical microscope, as I have often done; for this purpose the young larva is as good or perhaps better than an old female, but it travels so rapidly that it is impossible to keep it long enough in the field of a *good* microscope to make a satisfactory examination of the feet—the all-important organs in family classification here; and if on the back the incessant motion of the legs, sweeping through the field of vision so rapidly, gives a very poor and unsatisfactory view. But for a thorough examination I must insist on putting the living insect under a good microscope, and although the pregnant female is a clumsy, globular looking mass, with the legs apparently so close on the body as to be nearly out of view, yet I find it the best state for examination, and it will lie on its belly, side or back, as we may place it, long enough to examine it carefully, especially when pretty cool; if we place it on the side or back we can get a very good view of the feet, and we can see to good advantage the digituli, curved from above downward, and also the movement control that the insect has over them, diverging, approximating, elevating and depressing them; under a poor glass these will be mistaken for long slender claws, but the true claws will be seen just beneath them, and when on the back or side with the leg projecting out leisurely from the body or sweeping through the field of vision, I have watched them for many hours without being able to solve the problem of one or two claws, so close does the insect keep them when they are curved in under the foot, as they always are when in these positions. But place it on its belly on the smooth glass plate, and it vainly struggles without being able to move from the spot; it thrusts out its legs, and, as might be supposed, naturally enough spreads every organ of the feet, over which it has muscular control, to aid locomotion; looking from above downward we see the long hair-like digituli, with their globular ends, sweeping over the glass plate; the globe not becoming distorted or brushed off, we are convinced that it is not a

* I would here raise the inquiry, inasmuch as *winged* males are so very rare, may not some of these supposed females be apterous males, especially in these perfectly round galls, apparently made by one mother, wherein we often find several apterous female like imago, usually somewhat smaller than the one original parent of the colony? Otherwise, how can we account for the fertilization of the eggs that are to pass the winter? *Winged* males certainly, on account of their extreme rarity, do not fertilize many; yet from appearances, their numerous enemies, their great liability to destruction from every cause, and with all their great abundance, many certainly must become fertilized from some source. This is a point yet open for investigation.

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liquid exudation, but a true solid member of the body; its hair-like pedicel may be seen occasionally to bend, thus proving its pliability; the pedicels, as well as the globes, are translucent, and without doubt are composed of the same leathery structure as other parts of the skeleton, and in the cast skin they appear as perfect as in the living animal; these are remarkable appendages, entirely unlike anything which we ordinarily see in the anatomy of insects. Burmeister, in his admirable *Manual of Entomology*, so far as I at present have it in remembrance from thorough study some years ago, fails to observe anything of the kind, and I can only conjecture that their use is to enable this small insect to climb with safety over the down of the tender grape leaf, with which it is abundantly supplied, when the down and hairs are so long as to prevent the ungues from reaching the bark. This instrument is admirably adapted to lock firmly between the projecting hair and down of plants, and convey the insect through this forest of down with safety. The globe on the end may also possibly be a gland, secreting a viscid substance, but of this I have no ocular demonstration. On either side of these digituli we see a diverging spine nearly equalling them in length, and between them we see a short stub or spine-like body, less than half their length. I have not minutely examined this, having only seen it in the field from above; it may probably be the spurious claw—*pseudonychia* of Burmeister, or undeveloped digituli. Beneath these the claws, one on each side, can be plainly seen widely spreading on the smooth glass as the insect vainly struggles to move forward; these claws are much curved, short, and comparatively thick and strong, appearing light horn-colored under a good achromatic microscope.

With such an armor as this we cannot help viewing with admiration the wonderful adaptability of nature to the wants of so frail a creature; by the means of the four-fingered and two-clawed hand, as it were, alone, it can travel with as much safety from the parent gall, far below on the vine, up over the forests of down that it may encounter on the plant in its progress to the tender bud, as the monkey travels over the tops of the trees in the dense jungles of tropical climes; without these, amidst the atmospheric storms, it must fail to reach the tender bud, where alone it is able to construct a new gall and repeat the work of its parent and fulfil the unworthy object of its being.

While the insect is on its back, to examine the tarsi, promuscis, &c., you will not fail to observe the manual dexterity displayed as it seizes hold of the promuscis and setæ, with this hand-like organ, and pulls them away to one side as it struggles and kicks in the vain effort to right its position. Perfectly at home in the snug tenement—its gall—it is almost as unhappy on the hard smooth glass-plate of a microscope as a fish is on dry land, unwillingly a martyr to science.

To examine the nature of the articulations you will prefer a larva; they are very imperfect, appearing externally like a mere thinning of the leathery structure of its limbs, with no well-defined line of union between the tibia and tarsus; this dermal membrane about the joint wrinkles as it bends the organ in locomotion; the lower end of the tibia projects into a prominent heel on which it treads heavily.

I believe that the females are never winged in any season of the year, if they are in the spring they are not much used. I see here grapes, not more than one hundred yards from the vines, so completely covered with them, entirely free, and have thus remained during three summers, while another cluster of grapes taken in the early spring from among the affected ones and planted at some distance in another direction, are in like manner affected. This fact, in a measure, is confirmatory of my former conjecture, that these insects probably survive the winter in galls on the tendrils and vine stalk, or it may be occasionally that the egg, falling into small crevices in the old bark, thus passes through the winter. If there is any freezing of these eggs, the burying of the vine in the earth and snow affords them protection. Now, as the leaves are falling, many of the galls are full of eggs and very few of them are hatching, and with the

increasing coldness of autumn it will cease altogether; soon after falling the leaf dries and consequently the gall shrinks and gapes open; thus many of the eggs can fall out on the ground around the roots, and in this way chiefly do they survive the winter. In transplanting they are conveyed with the earth around the roots. In the early warm summer weather these eggs hatch and the young louse, instinctively, resorts to the vine and ascends to the leaf in quest of food. Thus they are perpetually preserved about the once affected vine and removed from place to place in transplanting.

Their natural enemies may hold them in check, but will never subdue them. When they become too numerous to obtain a sufficient supply of their insect-food readily everywhere they die of starvation, while some of these lice are still living in security enough to continue the species. Their enemies are numerous, and I never go forth to investigate, even now at the end of long years of study, without discovering something new and interesting Their natural history is inexhaustible; insignificant as it may seem to be, it is an object of the deepest interest when we come to the examination with our eyes open to the truths that develop around us and force themselves upon our consideration.

The winged males are very rare, among the rarest of the rare, as I have found by experience, at least in this region. I have opened more than ten thousand galls and never saw but four winged imagos; one I found late in September of last year, and three during the present autumn; two were somewhat imperfect but useful material for examination; two I took from one gall a few days ago, one of them was entirely perfect, it was an admirable specimen for examination; it enabled me to get the precise position of the wings in repose. They are very liable to be crushed or injured in opening the galls, because it is necessary to open them rapidly to make any progress, and a very little water entering a gall causes the wings to adhere, frail membranes as they are, and greatly damages them. I also found three male pupæ and a parent female and eggs in a gall. I failed to raise either of these pupæ; they soon perished after the gall was removed from the vine, refusing to leave the old drying gall for fresh ones placed beside them.

Having thus found four male imagos and seen the pupa, there appears to be no further good reason why I should longer delay the publication of my supposed new genus and family and my observations, except that I wish to forward a supply of them to learned societies, but as they are so exceedingly rare it appears like hoping against hope.

As this is a very common insect it needs a common name, and I think no better could be given it than that suggested in the *Prairie Farmer*, (Aug. 4, 1866,)—"*Grape leaf louse.*"

Mount Carroll, Ills., Oct. 8, 1866.

Note.—My description and the details of my observations of these insects may appear quite prolix, but on account of the various erroneous opinions held by popular authors regarding them, I have been induced to give a pretty minute description of the insects in their *different* states, and the method of conducting my observations, so that others may the more readily verify them, from even larva and females, my only object being the development of truth.

Dr. Fitch locates them in the *Aphis* family, while Mr. Walsh classes them among the *Coccidæ;* they appear nearer the former than the latter. But the "grape leaf louse" certainly bears no generic resemblance to *Pemphigus* as Fitch declares, doubtless, without observation, which is hardly excusable in even the most popular writers.

For what reason, if any, Mr. Walsh could have announced, in the *Practical Entomologist*, vol. i., p. 111 and 112, that the *Vitifoliæ* gall "is the work of an insect, not of a plant-louse, however, as Dr. Fitch supposed, but as I have recently ascertained, of a true bark-louse belonging to the *Coccus* family;" and in further allusion to *his three gall-making bark-lice* unqualifiedly assures us that "any entomologist by examining either the *vitifoliæ* (insect) of Fitch, which I

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find on the wild *Vitis cordifolia* and on the tame Clinton grape-vine, or the gall *caryævenæ* of Fitch, which I find exclusively on the leaves of the Shellbark Hickory (*Carya alba*), and the third—an undescribed gall, the size of a cabbage seed, on the leaves of the Pig-nut Hickory (*Carya glabra*) may easily satisfy himself that the mother-louse inhabiting them does not belong to the *Aphis* but to the *Coccus* Family," &c., &c., *without telling us how to become satisfied that a plainly* TWO-*clawed tarsus belongs to the Coccus family*, is quite incomprehensible, and certainly utterly at variance with their true anatomical characters. My paper discusses two of these *supposed bark-lice*, and I believe that the third is of the same character. Dr. Fitch's "rashness" is here fairly paralleled by the accuser himself, in the same paper, by "fixing the *family* to which a particular larva belongs," as I have abundantly demonstrated. H. S.

Feb. 5th.

MR. VAUX, Vice-President, in the Chair.

Twenty seven members present.

Feb. 12th.

The President, DR. HAYS, in the Chair.

Thirty members present.

The death of R. Kennicott, member, was announced.

Feb. 19th.

The President, DR. HAYS, in the Chair.

Forty-four members present.

The following papers were presented for publication:

"A list of introduced plants, growing in waste ground below the Philadelphia Navy Yard, &c." By Aubrey H. Smith.

"On the Habits of the Cutting Ant of Texas." By G. Lincecum.

The following deaths were announced:

William Norris, a member, on the 5th of January; Brackenridge Clemens, M. D., of Easton, Pa., a correspondent; Prof. Alexander Dallas Bache, a member, at Newport, R. I., on the 17th inst.

Dr. H. Allen directed the attention of the members to some features of interest in the conformation of the mammalian skull, based upon examinations of specimens in the Academy's collection.

Having noticed in the skull of a Kronian negro, in the Wistar and Horner Museum of the University of Pennsylvania, the absence of union between the greater wing of the sphenoid bone (alisphenoid) and anterior inferior angle of the parietal bone, and in its stead a union at that point between the temporal and frontal bones, he was desirous of ascertaining to what extent the variation would be found present in a series of crania. With this object examinations of the human skulls, eleven hundred in number, were made, when the variety was found present in twenty three. With these it was thought to be the result of deficient developement of the great wing of the sphenoid bone, an interspace being left which was occupied by a process of the temporal sent forwards and upwards to articulate with the frontal bone.

This was rendered probable from the occasional occurrence of Wormian bones near the site of union. In five specimens out of the twenty-three Wormian bones were found placed between the squamo-parietal and squamo-frontal sutures, but more often in the former locality, when they were often associated with similar bones situated at the temporo-occipital region. The extent of the suture was subject to much variation; in some specimens it was an inch long and well marked, in others it was reduced to a mere point. In three specimens it was found on one side, the spheno-parietal being present on the other. In yet another the temporo-frontal was seen on one side and the spheno-parietal with Wormian bones on the other.

The whole number of specimens was distributed among the varieties of men as follows:

Anglo-Saxon, Pelasgic, Swede, Chinese, Hindu, Bengalese, Mandan, Seminole Indian, Blackfoot Indian, Iroquois, and Esquimaux, each one. The remaining twelve were negro.

This observation lead to the examination of the skulls of the mammalia, the result being as follows:

Spheno-parietal suture.	*Temporo-frontal suture.*
Simia morio,	Troglodytes niger,
Simia satyrus, ex,	Hylobates,
Semnopithecus,	Cercopithecus, ex,
CATARRHINI,	PLATTYRRHINI,
LEMURIDÆ,	Bison,
MARSUPIALIA,	Bos,
CARNIVORA,	Tragus,
CETACEA,	Tapirus,
SIRENIA,	Rhinoceros,
RUMINANTIA, ex.	Sus,
Cheropsis,	Equus,
Hyrax,	RODENTIA,
Dicotyles.	EDENTATA,
Troglodytes gorilla,	Hypsiprymnus.

In the anthropoid apes it was found that the temporo-frontal suture was constant in the skull of all the species excepting *S. morio* and one specimen of *S. satyrus*. Prof. Owen* mentions the spheno parietal articulation in *S. satyrus*, and considers it a distinctive character of Simia; but in the skull of a young individual examined, the suture was indubitably temporo frontal. Out of seventeen specimens of Cercopithecus in the collection seven had the spheno-parietal articulation. In two of these it was spheno-parietal on one side, temporo-frontal on the other.

In the Ruminantia the alisphenoid was very slightly developed, the union being effected by the external angular process of the parietal growing downwards in a long falciform extension. This was seen to be a conspicuous feature in the skulls of this order. The variation noticed in Bison, Bos and Tragus, had its origin in the first two genera in the unusual development of the frontal bone backwards and outwards, reaching the temporal bone by cutting off, as it were, the descending process of the parietal. In the last, one specimen only was examined; the spheno-parietal union was complete on one side, while the temporo-frontal was but faintly determined on the other. It was thought probable that the skulls of young individuals of these genera would show upon examination the same plan of construction in this particular as others of the order.

The suture was seen to be invariable in Carnivora, Cetacea, Sirenia, Edentata and Rodentia; but inconstant among the members of Marsupialia and the Cuvierian order Pachydermata. Among the marked contrasts here observed were those between Sus and Dicotyles, Hyrax and Rhinoceros

* Trans. Zool. Soc., vol. i., 1835, 368.

From the early obliteration of all cranial sutures in Cheiroptera and Insectivora—many young individuals of the former order were examined—nothing definite was ascertained concerning them. It is reasonable to suppose that they resemble the Carnivora.

Dr. Allen further spoke of a distinguishing feature between the skulls of the new and old world monkeys. In the former there is no bony external meatus; in the latter there is a well defined osseous tube as in man. He also invited attention to an interesting feature in the skull of a young Chimpanzee, in which it was found that the lachyrmal and ethmoid bones were separated from one another by an ascending process of the orbital plate of the superior maxilla, which articulated with the internal angular process of the frontal bone. The peculiarity had not been seen in any ape, though a human skull in the collection (Esquimaux) exhibited it.

It was thought that the subject of sutures was of interest from an anatomical stand-point and might, after more extended comparison, prove of value in classification.

A letter was read from Dr. Charles M. Wetherill as follows:

Bethlehem, Pa., Feb. 16th, 1867.

WM. S. VAUX, ESQ.:

Dear Sir,—Will you do me the favor to communicate to the Academy the following results, which I have reached in an investigation (not yet completed) upon the Itacolumite.

The so-called flexible character of this sandstone is universally attributed to the mica which it contains. I have succeeded, beyond a doubt, in establishing the fact that the said motion is due to innumerable ball and socket joints. This wonderful molecular grouping warrants, I think, the suggestion of "*articulites*" as a generic name for this class of sandstones. I succeeded in first observing the play of these joints upon their sections under the microscope, taken in three planes relative to the plane of stratification. It is, however, unnecessary to incur the labor of preparing such sections; the motion may be perceived with any fragment by examination with the microscope, moving the loose particles in the joints with the needle point, or removing the said particles, thus dissecting the specimens.

The joints are not similar to those observed in columns of basalt. The fragments of quartz are very small and very sharp; twenty, thirty or more of these sand particles are cemented to each other to form irregular compound molecules. The protuberances of these are engaged in the cavities of neighboring groups, and so irregular and abundant is the jointing, that a slight motion is permitted in any direction.

A long thin rod of the sandstone may be twisted, elongated, compressed longitudinally, or bent nearly equally in any direction. When suspended by its extremities, the rod takes the form of a curve which very nearly approaches a true catenary. My friend and colleague, Prof. E. W. Morgan, of the Lehigh University, is, at my request, studying the exact nature of the curve thus formed.

The specimens examined are from two localities; from Mines Geraes in Brazil, a specimen in the collection of the Smithsonian Institution; and another from Stokes Co., N. C. An analysis of the latter showed a large proportion of silicic acid, and the cement, if it be one, which unites the grains of sand, is not ferruginous, as was shown by boiling a thin section, during a considerable period, with hydrochloric acid.

I would be very much obliged to you (or to any member of the Academy,) if you would furnish me with specimens of Itacolumite from different localities for this investigation.

I have thought that the establishment of the curious molecular character of this mineral might lead to a knowledge of the physical conditions by which it was effected and perhaps throw light upon that vexed question, the origin of the diamond. Very truly yours.

Feb. 26th.

The President, DR. HAYS, in the Chair.

Thirty-eight members present.

The resignation of Dr. H. C. Wood as Recording Secretary was accepted.

Joseph Jeanes tendered his resignation as Corresponding Secretary, which was accepted.

Resignations of membership were tendered by James Starr and J. Heintzleman, and were accepted.

A communication was received announcing the organization of the Conchological Section of the Academy, and the election of its officers.

Dr. Harrison Allen was elected Corresponding Secretary of the Academy for the remainder of the year, and Dr. S. B. Howell, Recording Secretary, for the same period.

The following were elected members:

Evan Randolph, Francis R. Cope, Joseph Patterson, Richard M. Marshall, Benjamin Marshall, John Livezey, Charles H. Borie, Thomas P. Cope, Miss R. A. Cope, Mrs. E. H. Vaux, Joseph S. Lovering, Jr., Samuel P. Carpenter, Richard R. Robb, William Hacker, Stephen Colwell, Miss Ann Haines, Miss Jane R. Haines, F. L. Bodine, Horace M. Bellows, M. D., John G. Stetler, M. D., William Procter, Jr., and Anthony Heger, M. D., U. S. A.

The election for Standing Committees, deferred from the last business meeting, was held with the following result:

ETHNOLOGY.

J. AITKEN MEIGS,
S. S. HALDEMAN,
F. V. HAYDEN.

BOTANY.

ELIAS DURAND,
AUBREY H. SMITH,
H. C. WOOD, JR.

COMP. ANAT. AND GEN. ZOOLOGY.

JOSEPH LEIDY,
HARRISON ALLEN,
S. B. HOWELL.

MINERALOGY.

WILLIAM S. VAUX,
S. R. ROBERTS,
ALBERT LEEDS.

MAMMALOGY.

J. H. SLACK,
E. D. COPE,
HARRISON ALLEN.

GEOLOGY.

ISAAC LEA,
F. V. HAYDEN,
T. A. CONRAD.

ORNITHOLOGY.

JOHN CASSIN,
SPENCER F. BAIRD,
B. A. HOOPES.

PALÆONTOLOGY.

T. A. CONRAD,
JOSEPH LEIDY,
F. V. HAYDEN.

HERPETOLOGY AND ICHTHYOLOGY.

EDWARD D. COPE,
S. WEIR MITCHELL,
CHARLES SHAEFFER.

PHYSICS.

ROBERT BRIDGES,
ROBERT E. ROGERS,
JACOB ENNIS.

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CONCHOLOGY.

GEORGE W. TRYON, JR.,
E. R. BEADLE,
C. F. PARKER.

ENTOMOLOGY AND CRUSTACEA.

JOHN L. LE CONTE,
J. H. B. BLAND,
TRYON REAKIRT.

LIBRARY.

JOSEPH LEIDY,
JOHN CASSIN,
ROBERT BRIDGES.

PROCEEDINGS.

JOSEPH LEIDY,
WILLIAM S. VAUX,
JOHN CASSIN,
ROBERT BRIDGES,
GEORGE W. TRYON, JR.

On favorable report of the respective committees, the following were ordered to be published :

On Colonies of PLANTS observed near Philadelphia.

BY AUBREY H. SMITH.

During the years 1864, 1865 and 1866, a large number of introduced plants, chiefly southern, were found growing on the waste grounds below the Philadelphia Navy Yard, and at Kaighn's Point and Petty's Island, on the opposite shore of the Delaware.

It has been thought by those who were engaged in the work of collection, that some account of these localities and a list of the plants themselves should be placed at the command of students investigating the subject of the introduction and naturalization of plants. To meet this view I have prepared the following pages.

The city of Philadelphia is built on a low gravelly bluff, extending along the right bank of the Delaware with little interruption from Kensington on the north to the Navy Yard on the south. It is scarcely practicable now to define accurately the limits of this bluff, but it may be stated, in general terms, that above Kensington and below the Navy Yard, it recedes from the river, and its place is supplied by tide marshes to a greater or less extent. Northward these marshes have been largely filled up and built upon, but southward the low margin of the river has been but partially reclaimed.

Immediately below the Navy Yard, the rim of tide marsh does not exceed two or three hundred yards in width. Further down the river it widens greatly, and has been banked in for agricultural and grazing purposes. Between the Navy Yard and the banked meadows, the tide flats have awaited the slow demands of commerce for their utilization.

The first step to the reclamation of the flats is the extension of the lines of the eastern streets to the line of low tide, and the building of bulk-heads of logs at their extremities below low water mark. The streets thus extended are filled up with waste earth from cellars and similar excavations, and thus causeways are made out to the bulk-heads. Next, the bulk-heads themselves are extended right and left to meet similar works from the ends of other streets. The wharf line thus built is then conveniently secured by the deposit behind it of sand and gravel ballast from coasting vessels, as well as of earth brought specially for the purpose. Behind it, there will, of course, exist a pond or lagoon, to be filled up from time to time, from the river or from the land, as materials may offer themselves on either side of it.

From Dickerson Street northward to the Navy Yard, the flats have been entirely reclaimed, and coal wharves and ship yards occupy their place. Southward of this street, at the distance of six or seven hundred feet, an earthen embankment extends Morris Street to the line of low water, and a bulk-head

carried to the left connects this causeway with the reclaimed land at Dickerson Street. A pond, not now of more than three acres in extent, lies behind the bulk-head, and communicates with the river by a covered sluice, through which the tide ebbs and flows. Between the pond and the river are some two acres of ground made by the deposit there, through many years, of sand and gravel ballast from the coasters, and of mud from the cleansing of the docks of the city. On the west and north the pond is rapidly diminishing in size, as waste materials from the city are cast into it, and in a few years it will no doubt wholly disappear. The marshes formerly existing above Dickerson Street have been reclaimed by the same process, and those below Morris Street will in time be dealt with in a similar manner. Upon the reclaimed land behind the bulk-head between Dickerson and Morris Streets have been found the greater part of the plants enumerated in this list. This locality, which for convenience we have called the Ballast Ground, did not exist fifteen years ago, for the bulk-head which protects it from the river has itself been built within that period. Some of the plants may, however, have existed in similar places along the river for a long time. Muhlenberg, in his catalogue published in 1813, mentions *Senebiera didyma* and *Cynodon Dactylon* as plants of Pennsylvania, though since his day they have only been found, so far as I have learned, at or near this place. *Salsola Kali* is not rare in the waste grounds about Philadelphia, and *Atriplex hastata*, its maritime congener, is abundant in every neglected out-lot. *Pluchea camphorata* and *Aster linifolius* are firmly established in a pool, at the foot of Tasker Street, not connected with the pond behind the Ballast Ground and probably of much older date and different origin, whilst *Artemisia biennis* is abundant in by-places for half a mile about.

The unenclosed grounds below the Navy Yard are in some respects very favorably situated for the growth of southern plants. The trend of the river shore being south by west, the whole width of the city spreads between them and the quarters from which the colder winds blow. Those of the north and north-west must pass before reaching the Navy Yard for four or five miles over houses and factories, the innumerable fires of which will at all times temper their rigor, whilst the easterly, southerly and south-westerly winds are made yet milder by the wide expanse of water over which they come. The ground too being at the level of tide offers the most favorable conditions, so far as elevation is concerned.

I regret that it has not been in my power to obtain thermometrical observations from which a comparison might be made of the average temperatures, at different seasons, of several points in a line running north-westwardly from the Navy Yard to Girard College. From these we could learn whether or not the causes I have indicated are able to produce sensible effects on the vegetation at the margin of the river. Those at Girard College are all that are needed for that station, but, there being no intermediate ones, they are of no avail for the present purpose.

Nearly opposite the Ballast Ground, on the New Jersey side of the river at Kaighn's Point, is a large enclosed ship and timber yard, which presents conditions somewhat similar to those of the locality just described. A portion of the low ground at this place has been filled in and levelled out to the wharves and bulk-heads, whilst another part of it remains nearly in its natural state. From this enclosure come the most of the plants attributed in this list to Kaighn's Point, though a few of them have been found without its limits.

Petty's Island is a tract of reclaimed alluvion on the New Jersey side of the Delaware, opposite the mouth of Cooper's Creek, which has been, to some extent, used of late years as a place of deposit for ballast, sand and other waste and rough material. It was not known as a botanical locality of interest until visited during the present year (1866) by Mr. Isaac Burk. Since his discovery of it, however, it has been constantly and carefully watched by him and other botanists, and the results of their observations are to be found herein.

Both Kaighn's Point and Petty's Island share the advantages for the growth

and naturalization of the plants of warmer climates which have been ascribed to the Ballast Ground. Sheltered by the wide sweep of the city crescent from the colder winds, they lie at the level of tide with the broad expanse of the river, further to temper the atmosphere which reaches them.

I have been thus minute in the description of these localities, in order not only that the circumstances under which these curious colonies of strangers have taken up their abode with us may be understood, but, in the anticipation of their speedy destruction as the city extends its limits, and of the establishment of similar ones elsewhere on its outskirts, that those who shall observe such future settlements may have the means of tracing their history and development.

The Ballast Ground locality was discovered by Messrs. Diffenbaugh and Parker in the latter part of the season of 1864; that at Kaighn's Point was made known about the same time by the last named gentleman. Since then the plants of those places, and in 1866 those of Petty's Island, have been carefully watched and collected by a number of botanists. Among these I may especially mention Dr. Martindale and Messrs. Burk, Diffenbaugh and Parker, to each of whom I am indebted for some of the rarest in the list.

All the plants have been submitted to Prof. T. C. Porter, and the determinations in all cases of difficulty have his full concurrence. Dr. Porter himself shared the work of collection.

It will be observed in many instances that the fruit has not matured, and in some that not even the flower has appeared. This may not always have been due to the shortness of the season, but sometimes to the late deposit of the sand or gravel with which the seeds have been brought from the south.

A small number of the plants of 1864 did not re-appear in 1865, and some of those of 1865 were not found in 1866. One or two of them, threatened by the frost before flowering or fruiting, were transplanted, and developed their characters under glass. For this service we are indebted to Mr. Kilvington and Dr. Leidy.

Many plants were found growing with those enumerated in the list, which are regarded as introduced, but which are not strictly confined to the localities above described. Some of these are rare and of limited distribution. Nevertheless, but few of them have been included herein, inasmuch as this list is intended, in the main, to contain the names only of those which have not hitherto been collected in the neighborhood of Philadelphia. At a subsequent period, a supplemental catalogue may be given of such of these as shall be deemed of interest.

This list exhibits, as nearly as my information enables me to give it, the actual state of the adventive flora of the several localities in each of the years of collection; but it is proper to say that the time which has elapsed since their discovery has been too short to justify any positive assertion as to the completeness of the catalogue, or the appearance or disappearance of any of the plants named in it.

1. Erysimum orientale, *R. Br.* (*Brassica orientalis*, L.) Three specimens collected at Kaighn's Point in 1866. Fruit perfected. Adv. from Europe, where it is widely distributed.

2. Sinapis alba, *L.* A single plant, collected on the waste grounds northwest of the Ballast Ground by Mr. Diffenbaugh, on the 17th June, 1865. Fruit perfected. Adv. from Europe.

3. Senebiera didyma, *Pers.* Ballast Ground and Kaighn's Point, Sept. and Oct., 1864, 1865, 1866. Abundant and in mature fruit—rather less common in the latter year. *Hab.*—North Carolina to Florida; Chapman. Also waste places at ports, &c., Virginia to Carolina—an immigrant from farther south; Gray.

4. Senebiera Coronopus, *Poir.* A single specimen collected on the Ballast Ground by Mr. Burke in 1865. Adv. from Europe.

5. Cakile Americana, *Nutt.* Ballast Ground, Sept. and Oct, 1864, 1865. Very few specimens. *Hab.*—Sea coast and Great Lakes; Gray.

6. Sagina subulata, *Torr & Gray.* (*S. Elliottii*, Fenzl.; *Spergula subulata*, Swartz).

Ballast Ground, 1865, 1866. Less frequent in the latter year. Fruit perfected in both seasons. These specimens, and others apparently of the same species from Charleston, S. C., are glandular hairy on the peduncles and calyx,—not smooth, as in S. Elliottii, according to Chapman.

In the spring of 1865, Mr. Charles E. Smith collected at Somer's Point, N. J., a slender form of S. subulata, which Dr. Gray regards as a variety, and has called, from the discoverer, var. Smithii. Dr. Gray now considers S. Elliottii not distinguishable from S. subulata.

7. Sesuvium Portulacastrum, *L.* Two small patches near the southern end of the Ballast Ground, 1865. Fruit matured. *Hab.*—Sea coast of New Jersey and Southward; Gray.

8. Sesuvium pentandrum, *Ell.* Petty's Island, 1866. Not frequent; fruit perfected. *Hab.*—Sea coast, North Carolina to Florida; Chapman.

9. Portulaca pilosa, *L.* Petty's Island, 1866. Infrequent and with fruit not fully developed. *Hab.*—Key West, Florida; Chapman.

10. Malvastrum tricuspidatum, *Gray.* Pl. Wright, Pt. I., p. 16. (M. carpinifolium, *Gray.* Pl. Fendl., p. 22.) Two specimens with imperfected fruit collected by Mr. Burk and Diffenbaugh, on the Ballast Ground, in 1865. Dr. Porter has two specimens from the same locality with perfected fruit. This plant is probably the Malva Americana of Muhlenberg's Catalogue, p. 62, where it is recorded as growing in Pennsylvania. *Hab.*—South Florida; Chapman.

11. Sida stipulata, *Cav.* A considerable number of plants scattered over the Ballast Ground, Sept. and Oct., 1864, 1865. In flower and with fruit nearly perfected. *Hab.*—Waste places about dwellings—Florida. According to DC., this plant has naturalized itself in many parts of the world.

12. Modiola multifida, *Moench.* Appeared in leaf only on the Ballast Ground late in the autumn of 1865. It was transplanted by Mr. Kilvington, and, placed under glass, produced its flowers and fruit in April, 1866. *Hab.*—North Carolina to Florida; Chapman.

13. Kosteletzkya Virginica, *Presl.* A few specimens collected on the eastern margin of the pond, but none with mature fruit. Sept. and Oct., 1865. Also at Kaighn's Point in the same year. *Hab.*—Marshes along the sea coast, from Long Island southward; Gray.

14. Gossypium herbaceum, *L.* Eastern and western margins of the pond. Oct., 1865, 1866. Flowers in both seasons, but no fruit.

15. Trifolium Carolinianum, *Mx.* Ballast Ground, 1865. Abundant and with perfect fruit Less frequent in 1866. Two specimens at Kaighn's Point in the latter year. *Hab.*—North Carolina to Florida; Chapman.

16. Melilotus parviflora, *Desf.* (*M. occidentalis*, Nutt.) Ballast Ground and Kaighn's Point, 1865, 1866. Abundant and with mature fruit in both seasons. Adv. from Europe into Western Texas and Mexico. (U. S. Boundary Survey, Emory, Vol. II., p. 55.)

17. Medicago maculata, *Willd.* Ballast Ground, collected Oct. 14, 1866. Two specimens without flower or fruit. Adv. from Europe.

18. Medicago denticulata, *Willd.* Ballast Ground, 1865, 1866. Rare, fruit perfected, more frequent in the latter year. Adv. from Europe.

19. Glottidium Floridanum, *DC.* A single plant collected on the Ballast Ground, but more frequent at Kaighn's Point. Sept. and Oct., 1865. One specimen at Petty's Island, Sept., 1866. Fruit not matured in any case. *Hab.*—South Carolina to Florida; Chapman.

20. Sesbania macrocarpa, *Muhl.* Ballast Ground, Sept. and Oct., 1865. Many specimens in full flower, but without perfect fruit. This plant and Glottidium Floridanum flowered about the 1st October, and were killed by the frost before their fruit was matured. *Hab.*—South Carolina to Florida; Chapman.

21. Ervum Lens, *L.* Federal Street wharf, Camden. Collected by Mr. Diffenbaugh, August 6th, 1865. Rare. Adv. from Europe.

22. Vigna glabra, *Savi.* Ballast Ground and Kaighn's Point, Sept. and Oct., 1865, 1866. Abundant in both places, but not perfecting its fruit. *Hab.*—Brackish marshes, from Florida to South Carolina; Chapman.

23. Cassia obtusifolia, *L.* Ballast Ground and Kaighn's Point, Sept. and Oct., 1865, 1866. A few flowering plants, but the fruit not matured. *Hab.*—North Carolina to Florida; Chapman.

24. Potentilla argentea, *L.* Collected at Kaighn's Point by Mr. Parker, June 4, 1865, with ripe fruit. Also at the Ballast Ground in 1865 and 1866. This plant has been observed in previous years near Red Bank, N. J. *Hab.*—Dry barren fields northward; Gray.

25. Potentilla anserina, *L.* Ballast Ground, 1865. A single specimen collected in flower by Mr. Diffenbaugh. *Hab.*—Brackish marshes and river banks, chiefly northward; Gray.

26. Ammania latifolia, *L.* Two specimens collected near the eastern margin of the pond by Mr. Diffenbaugh, Sept. 8, 1865. Fruit not matured. Two from the same place by Mr. Burk in 1866, with perfect fruit. It was also collected by Mr. Parker at Kaighn's Point, in 1866, in good fruit. *Hab.*—Ohio, Illinois, and southward; Gray.

27. Œnothera sinuata, *L.*, var. humifusa, *Torr* and *Gray.* Sparingly distributed on the Ballast Ground, Sept., 1866. *Hab.*—Drifting sands along the coast; Chapman.

28. Gaura sinuata, *Nutt.?* Collected on the Ballast Ground by Mr. Parker, Sept. 30, 1864. Fruit scarcely matured.

29. Jussiæa repens, *L.* Along the margin of the pond in several places; also at Kaighn's Point, 1864, 1865. In flower and with matured fruit. Kaighn's Point, 1866. Fruit perfected. Also at Petty's Island, 1866, but rare. Fruit perfected. *Hab.*—In water, Illinois, Kentucky and southward; Gray.

30. Jussiæa leptocarpa, *Nutt.* Along the margin of the pond, 1865. Several specimens, but the fruit not matured. *Hab.*—In marshes, Florida, and westward; Chapman.

31. Jussiæa decurrens, *DC.* Ballast Ground, 1865. Rare. *Hab.*—Ditches, Florida to North Carolina, and westward; Chapman.

32. Leptocaulis divaricatus, *DC.* Ballast Ground, 1865. Several specimens with perfected fruit. Kaighn's Point, 1866. Two specimens. *Hab.*—Sandy soil, North Carolina to Florida; Chapman.

33. Asperula arvensis, *L.* Ballast Ground, 1866. A single plant collected in flower, by Mr. Burk. Adv. from Europe.

34. Galium tricorne, *Host.* Ballast Ground, 1866. Collected by Mr. Burk. Larger than the European form. Adv. from Europe.

35. Diodia Virginica, *L.* Ballast Ground, 1865. Abundant and in perfect fruit. *Hab.*—Virginia and southward; Gray.

36. Oldenlandia glomerata, *Mx.* A single specimen from the Ballast Ground, but more frequent at Kaighn's Point. *Hab.*—Western Pennsylvania to Illinois, and southward; Gray.

37. Polypremum procumbens, *L.* Ballast Ground, Sept. and Oct., 1864 and 1865. Kaighn's Point, 1865, 1866. Abundant, fruit perfected. *Hab.*—Sandy fields, Virginia and southward; Chapman.

38. Eupatorium fœniculaceum, *Willd.* Growing freely on both sides of the river, Sept. and Oct., 1864, 1865. Scarcely so abundant in 1866. Fruit not matured in either season. *Hab.*—Virginia, near the coast and southward; Gray.

39. Eupatorium serotinum, *Mx.* At the eastern edge of the pond, Sept. 30, 1865. Fruit not matured. Also at Petty's Island, Sept., 1866, in flower only. *Hab.*—Illinois and southward; Gray.

40. Aster linifolius, *L.* At the foot of Tasker Street, in a pool west of and not connected with the main pond. Abundant and in perfect fruit., Oct., 1864, 1865, 1866. *Hab.*—Salt marshes, Maine to Virginia; Gray.

41. Solidago sempervirens, *L.* Eastern margin of the pond, Oct., 1865. More abundant in 1866 at the same place. Fruit matured in both years. *Hab.*—Salt marshes, Maine to Virginia; Gray.

42. Hetherotheca scabra, *DC.* Abundant on both sides of the river in Sept. and Oct., 1864, 1865, and 1866. Fruit matured. Rather less plentiful in 1866 than in the former years. *Hab.*—Sandy places along the coast of South Carolina and westward; Chapman.

43. Pluchea camphorata, *DC.* In the pool at the foot of Tasker Street, and at Kaighn's Point, Sept. and Oct., 1864, 1865, 1866. Also along the eastern margin of the main pond in the latter year. Abundant and in perfect flower and fruit. *Hab.*—Salt marshes, Massachusetts and southward; Gray.

44. Pluchea fœtida, *DC.* Kaighn's Point, 1865. Collected by Mr. Parker, in flower only, on the 21st Sept. *Hab.*—Ohio to Illinois, and southward; Gray. Florida and northward; Chapman.

45. Iva frutescens, *L.* Several specimens, collected in leaf along the western margin of the pond, Sept. and Oct., 1865. *Hab.*—Sea coast, Mass., and southward; Gray.

46. Parthenium Hysterophorus, *L.* Ballast Ground, Sept., 1864. Two specimens collected by Messrs. Parker & Diffenbaugh, in flower and young fruit. Kaighn's Point, 1866,—a single plant. *Hab.*—East and South Florida; Chapman.

47. Helenium quadridentatum, *Labill.* Ballast Ground, Oct., 1864. Rare. In flower and young fruit. Rather plentiful at Petty's Island in 1866. *Hab.*—North Carolina and westward; Gray.

48. Centaurea Calcitrapa, *L.* Kaighn's Point, 1865. Scarce. *Hab.*—Norfolk, Va.; Gray. Adv. from Europe.

49. Artemisia biennis, *Willd.* Abundant in waste places, for half a mile, about the Navy Yard, 1864, 1865, 1866. Also at Petty's Island in the latter

year, but not so plentiful. This plant, in full growth, is very much branched. *Hab.*—River banks, Ohio to Illinois, and northward; Gray.

50. Leontodon autumnale, *L.* Kaighn's Point, August, 1865, 1866. Petty's Island in the latter year. Rare. Fruit perfected. Nat. from Europe.

51. Pyrrhopappus Carolinianus, *DC.* Ballast Ground, 1864, 1865. Scarce. Kaighn's Point, 1866,—a single specimen only. *Hab.*—Sandy fields, from Maryland, southward; Gray.

62. Plantago heterophylla, *Nutt.* Ballast Ground and Kaighn's Point, 1865, 1866. Abundant in 1865. Less frequent in the latter year. Fruit perfected. *Hab.*—Maryland and Southward; Gray.

53. Anagallis arvensis, *L.*, var. cœrulea. Ballast Ground, 1866. A single specimen collected by Mr. Burk. Nat. from Europe.

54. Collinsia parviflora, *Dougl.* Ballast Ground, 1865. A single specimen collected in fruit by Mr. Burk. *Hab.*—South shore of Lake Superior, and thence westward; Gray.

55. Herpestis Monniera, *H. B. K.* Petty's Island. Collected by Mr. Burk in flower and mature fruit, on the 21st October, 1866. *Hab.*—Maryland and southward along the coast; Gray.

56. Conobea multifida, *Benth.* Ballast Ground and Kaighn's Point, Oct., 1865. Also at Petty's Island, 1866. Rare and in perfect fruit. *Hab.*—Ohio to Illinois, and southward; Gray.

57. Gerardia purpurea, *L.*, var. fasciculata, *Ell.* Ballast Ground, 1864, Oct., 1866. In flower and fruit. *Hab.*—Sea coast, South Carolina to Florida; Chapman.

58. Verbena bracteosa, *Mx.* Kaighn's Point, 1866. In flower only. Scarce. *Hab.*—River banks, Wisconsin to Kentucky, Gray.

59. Calamintha nepeta, *Link.* Ballast Ground, 1864. Two specimens collected in flower by Mr. Parker. Nat. from Europe, in Virginia and southward.

60. Heliotropium Europæum, *L.* Ballast Ground, 1864, 1865. A single specimen collected by Mr. Parker in 1864. In 1865 several additional ones in flower only. Maryland, Virginia, &c.; Gray. Nat. from Europe.

61. Heliotropium Curassavicum, *L.* Ballast Ground, 1865. A single plant growing in calcareous sand. Abundant and in full fruit at Petty's Island in 1866. *Hab.*—South Florida; Chapman.

62. Nama Jamaicensis, *L.* Ballast Ground, 1865. A single specimen in fruit. *Hab.*—South Florida; Chapman.

63. Batatas littoralis, *Chois.* Ballast Ground, Oct. 9, 1865. Several plants in early flower, but without fruit. Also in 1866, but without flowers. *Hab.* Sea coast, Florida to South Carolina; Chapman.

64. Ipomea tamnifolia, *L.* Ballast Ground, Sept. 7, 1865. A single specimen collected in flower by Mr. Burk. *Hab.*—South Carolina to Florida; Chapman.

65. Dichondra repens, *Forst.*, var. Carolinensis, *Chois.* Petty's Island. Collected by Mr. Diffenbaugh, Oct. 21, 1866, without flower or fruit. Not frequent. *Hab.*—North Carolina to Florida; Chapman.

66. Petunia parviflora, *Juss.* (Ann. Mus. 2, p. 216, t. 47.) Ballast Ground, Sept., 1864, 1865. Rather frequent. Also in 1866, but very scarce. Abundant at Petty's Island in the latter year. *Hab.*—Lower Rio Grande and

Mexican States, westward to California. (U. S. Boundary Survey, Emory, Vol. ii., Part i., p. 155.)

67. Roubieva multifida, *Moquin.* Ballast Ground, 1865. Sparingly distributed throughout the central portion of the ground. Fruit matured. Adv. from tropical America.

68. Obione arenaria. *Moquin.* Ballast Ground, 1865. A few specimens with ripe fruit. Also in 1866 but scarce. *Hab.*—Sea coast, from Massachusetts Southward; Gray.

69. Chenopodina maritima, *Moquin.* Ballast Ground, 1864—1865. Not frequent. Fruit perfected. *Hab.*—Salt marshes along the coast; Gray.

70. Euxolus pumilus, *Raf.* Ballast Ground, 1865. A single specimen collected in flower by Mr. Diffenbaugh. *Hab.*—Sea coast from Long Island Southward; Gray.

71. Polygonum minus, *Hudson.* Ballast Ground, 1866. Collected by Mr Burk. Scarce. Adv. from Europe.

72. Euphorbia polygonifolia, *L.* Ballast Ground. Rare and not in flower in 1865. In 1866 a single specimen in perfect fruit. Also at Petty's Island in 1866, one plant. *Hab.*—Shores of the Atlantic and Great Lakes; Gray.

73. Euphorbia herniarioides, *Nutt.* Ballast Ground, 1865. In fruit. Petty's Island, Oct. 21, 1866, in fruit. Frequent. *Hab.*—Banks of the Ohio and Mississippi Rivers; Gray.

74. Euphorbia Helioscopia, *L.* Ballast Ground, 1864. A single specimen. Found elsewhere in Pennsylvania, though rare. Nat. from Europe.

75. Euphorbia exigua, *L.* Kaighn's Point, 1866. Collected by Mr. Burk in fruit. Scarce. Adv. from Europe.

76. Acalypha gracilens, *Gray.* Ballast Ground and Kaighn's Point, 1865—1866. Rare in both years. Common southward.

77. Croton glandulosum, *L.* Ballast Ground, 1864, 1865, 1866. Frequent and in ripe fruit. More abundant in the last of these years. *Hab.*—Virginia, Illinois and southward; Gray.

78. Croton maritimum, *Walt.* Ballast Ground, 1865. Leaves only. *Hab.*—Drifting sands along the coast from North Carolina to Florida; Chapman.

79. Phyllanthus polygonoides, *Nutt.* Ballast Ground. A single specimen collected by Mr. Diffenbaugh, Oct. 1, 1865. Fruit scarcely perfected. *Hab.*—Along the Rio Grande and westward in Mexico, (Boundary Survey, Emory, Vol. II, p. 193.)

80. Juncus articulatus, *L.*, var. obtusior, *Engelm.* Kaighn's Point and Petty's Island, 1866. Not abundant. J. articulatus has hitherto been found in the United States only in New England and Western New York.

81. Juncus nodosus, *L.*, var. megacephalus, *Tor.* Ballast Ground and Petty's Island, 1866. Not abundant. A northern plant not before found in the vicinity of Philadelphia.

82. Juncus bufonius, *L.*, var. fasciculiflorus, *Boiss.* Ballast Ground, 1865. Frequent. Dr. Engelmann states this to be a southern form widely diffused in intertropical regions.

83. Juncus Gerardi, *Loisel.* Petty's Island, 1866. Not frequent. *Hab.*—Sea coast from New Jersey northward; Gray.

84. Cyperus fuscus, *L.* Kaighn's Point, 1865. In mature fruit. Adv. from Europe.

85. Cyperus Nuttallii, *Torr.* Ballast Ground, Sept. and Oct., 1865, 1866. Abundant in 1865, less so in 1866. Also at Petty's Island in 1866, but not very frequent. Fruit matured in every case. *Hab.*—Salt marshes from Massachusetts southward; Gray.

86. Cyperus Michauxianus, *Schultes.* Ballast Ground, 1864, 1865. Frequent along the margins of the pond. Fruit perfected. Less common in 1866. Marshes especially along the coast, from New England southward; Gray.

87. Cyperus rotundus, *L*, var. Hydra, *Gray.* Ballast Ground and Kaighn's Point, Sept. and Oct., 1865, 1866. Abundant in both places in 1865; less frequent in 1866. Fruit matured, though most of the scales were empty. *Hab.*—Sandy soils along the coast from North Carolina to Florida; Chapman.

88. Cyperus compressus, *L.* Ballast Ground and Kaighn's Point, 1864, 1865, 1866. Frequent but least common in the latter year. Abundant at Petty's Island in 1866. Fruit perfected in each season. Found also in Maryland by Mr. Canby. *Hab.*—Florida to North Carolina and westward; Chapman.

89. Cyperus Baldwinii, *Torr.* Ballast Ground, 1864, 1865. Frequent in the sandy ground near the bulk-head, fruit perfected. *Hab.*—Florida to North Carolina and westward, Chapman.

90. Hemicarpha subsquarrosa, *Nees.* Petty's Island, Oct. 21, 1866. Scarce. Fruiting perfectly. Not before found near Philadelphia.

91. Lipocarpha maculata, *Torr.* Petty's Island, Oct 21, 1866. Scarce. Fruit perfected. *Hab.*—North Carolina to Florida; Chapman.

92. Fimbristylis spadicea, *Vahl.* Ballast Ground, 1865. Scarce, fruit perfected. *Hab.*—Salt marshes along the coast from New York southward; Gray.

93. Fimbristylis congesta, *Torr.* Ballast Ground and Kaighn's Point, 1865. Not scarce. In 1866 less common. Also at Petty's Island in 1866 but not frequent. *Hab.*—Florida and Westward; Chapman.

94. Fuirena squarrosa, *Mx.* Petty's Island, Oct., 1866. Scarce, fruit not matured. (Kaighn's Point in 1818. Barton in Flor. Phil. p. 37.) *Hab.*—Massachusetts and southward; Gray.

95. Alopecurus geniculatus, *L.* Ballast Ground. Collected by Dr. Martindale in 1865. Not before found in Pennsylvania.

96. Sporobolus Indicus, *Brown.* Ballast Ground and Kaighn's Point, 1865. Petty's Island, 1866. Not scarce, fruit perfected. The specimens from Petty's Island are prostrate, as in many maritime plants. *Hab.*—North Carolina to Florida; Chapman.

97. Spartina juncea, *Willd.* Ballast Ground, 1865, 1866. Sparingly distributed along the margin of the pond. Less frequent in the latter year. *Hab.*—Salt marshes and sea coast; Gray.

98. Eustachys petræa, *Desv.* Ballast Ground, 1865. Leaves and imperfect fruit; developed under glass by Dr. Leidy, it produced perfect fruit in 1866. *Hab.*—North Carolina to Florida along the coast; Chapman.

99. Cynodon Dactylon, *Pers.* Fully naturalized and abundant throughout the waste grounds below the Navy Yard. Also at Kaighn's Point, 1864, 1865, 1866. This plant was found at New Castle, Del., by Mr. C. E Smith, in 1864. A second form of it, nearly smooth and more robust, having pointed

paleæ and the flowering culms included in their sheaths, grows sparingly along the margins of the pond and elsewhere in the vicinity in damp places. Mr. Burk has observed this second form for twelve or fifteen years past on the hard dry surface of the Point Road below the old Southwark Canal. He states it to have been more abundant in 1866 than ever before. *Hab.*—Pennsylvania and southward; Gray. Nat. from Europe.

100. Dactyloctenium Ægyptiacum, *Willd.* Ballast Ground and Kaighn's Point, 1864, 1865, 1866. Common in both localities. Rather less frequent in 1866 than before. *Hab.*—Virginia, Illinois and southward; Gray.

101. Leptochloa mucronata, *Kunth.* Kaighn's Point, 1865. Not frequent. *Hab.*—Virginia to Illinois and southward; Gray.

102. Leptochloa fascicularis, *Gray.* Kaighn's Point, 1866. Collected by Mr. Burk. Scarce. *Hab.*—Rhode Island and Southward along the coast; Gray.

103. Glyceria distans, *Wahl.* Spreading over the vacant lots west of the Ballast Ground. Abundant. *Hab.*—Salt marshes along the coast; Gray.

104. Brizopyrum spicatum, *Hook.* Ballast Ground, 1865, 1866. Staminate plants only. *Hab.*—Salt marshes; Gray.

105. Paspalum distichum, *L.* Ballast Ground, 1864, 1865, 1866. Along the wet margin of the pond, in similar places at Kaighn's Point, and in 1866 at Petty's Island. Abundant and with mature fruit. *Hab.*—Virginia and southward; Gray.

106. Panicum amarum, *Ell.* Ballast Ground, 1865. Two flowering specimens. Again in 1866, but only one or two plants not in flower. *Hab.*—Sandy shores, Connecticut and southward; Gray.

The Cutting Ant of Texas—OECODOMA TEXANA, Buckley.

BY GIDEON LINCECUM.

In many portions of Texas this species of ant is quite numerous and troublesome. It is capable of and actually does perpetrate more real perplexing injury to the horticulturist and farmer, than all the other types of Texan ants put together. In form and color the larger varieties of them do not differ in appearance very much from the agricultural ants. A great portion of our citizens speak of these two ants without distinction, as being the same species. There is, however, a well-marked difference in their community regulations: in their manners and customs, in their mode of constructing their cities, in their peculiar food and manner of preparing it, and in their civil and military governments.

There are five varieties or castes in this species, all of which may be seen in the same community, or city as I prefer to call it. They vary in size from that of a drone honey bee down to near that of the little black erratic ant; and their duties and vocations are as variant as their sizes. The largest size have wings and are the mother ants. They dwell in the ground in sandy lands, and one of their long established cities will, on an average, occupy at least two square rods of surface. The area of the city is considerably elevated; often one to two feet, and sometimes even more. The earth which is thus thrown up, and which is universally sand, is thrown out from their numerous and capacious cells below, and from their extensive tunnels or subterranean passages. To their cells they have many holes, or places of entrance, and some of them are tunnelled off several hundred yards.

It is known to many observant Texans that in all the larger cities the ants

have penetrated the earth to water. This accords with my not very limited experience on the subject. I know of a number of wells which were intentionally sunk in the cutting ant hills to procure water, and I have been informed by the owners of these wells, that ant cells, tunnels and live ants were found all the way down to the water. I have myself seen and drank water out of eight of these wells, and have accounts of many others. I have not heard of a failure in any attempt for obtaining water by digging in a cutting ant hill.

Mr. G. W. Brooks states that, in Chappel Hill, Washington County, Texas, Columbus Pearson dug a well in an ant hill and obtained plenty of water at the depth of thirty feet. The facts in this case worthy of notice, and for which it is here recorded, is the manner in which the ants had also sunk two wells to the water. These ant wells were large and well-formed, one of them being fully twelve inches in diameter, the other six inches, both going straight down to the water. The walls of these wells were travel-worn and stained of a dirty brown color, presenting the appearance of having been in use for years. Mr. Pearson states that, if these ant wells had been opened properly, a bucket could have been let down the largest one at the outset.

Dr. Fechtig, of Brenham, informed me that he had been making observations on the cutting ant for some months; and some of his discoveries, which he was kind enough to communicate to me, are valuable and of an interesting character, particularly as they afford additional testimony in favor of observations I have made in reference to the disposition of the dirt which comes out of their tunnels, &c. These passages are always commenced within the compass of the city mound; the sand that is taken from the tunnels is always thrown back on the mound. These tunnels are made at the depth of eight to twelve inches, and in the direction of the object for which they are excavated. Sometimes, as I will show presently, on extraordinary occasions they are carried at a much greater depth. Dr. Fechtig's case, which I will now relate, was a tunnel from one of their cities to a neighboring well; the tunnel entering the well ten or twelve feet below the surface of the ground. The well being walled with oak timbers, the ants had cut their way through to gain access to the water. In performing the boring through the thick oaken curbing, they threw down into the well so much saw-dust that the people were forced to strain the water previous to using it. On examination Dr. Fechtig found that a quantity of oak chips, similar to those which had been separated from the well water, had also been thrown out on the ant mound.

Situated in a garden at Austin, Texas, there was a large, very populous and seemingly prosperous cutting ant city. The ants had for years, in spite of many patent traps and newly discovered ant poisons, damaged the garden extensively. The proprietor of the garden at last conceived the idea that he would try to drown them, and for this purpose dug a large basin-formed pit in the ant mound, and led trenches into it right and left from the hillside above the ant city, to convey the water into the basin when it should rain. Not long after this preparation was completed, there came a tremendous rain storm. Large quantities of water rushed along the ditches into the basin dug in the mound. To the gentleman's surprise the basin did not fill, but seemed to send forth hollow sounds. After the rain was over it was found that all the water which had been conveyed into the basin had been swallowed up. There is a creek with a flat rock bottom about seventy yards from the ant hill, and it was discovered that the water from the trenches had rushed down the wells of the ant city, washing out, down to the rock, (22 feet), an immense hole, thence along a great tunnel on top of the rock, to the before named creek, where the entire sluice, charged with millions of ants and sand and mud, made its escape into the creek.

Under a beautiful wide spreading live-oak (Q. Virens) on the west border of the town of La Grange, Texas, there was an extensive and flourishing ant city. The city mound was large, occupying the entire area overshadowed by the

live-oak. Nearly on a level and not exceeding eighty yards from the ant hill, there was a considerable pond of filthy water, which, being in the street, the town authorities ordered it drained. A ditch was opened along one side of the street which intersected the ant mound near its center, and for the purpose of inundating and drowning the ants, the workmen let the water into the ditch, and when it reached the mound (which had been ditched through to its further side) it found many open passages, down which it flowed quite freely. It was near night when the workmen left it, with the water passing into and seeming to be rapidly enlarging the hole it had already opened in the mound.

The workmen and a number of the town people visited the place next morning. The pond was dry, and the ant mound had also disappeared; and what was more wonderful still, the large live-oak had settled down into the chasm that had been made by the disappearance of tbe ant mound, until the lower limbs of the tree were resting on the brink of it. (The lower limbs of a prairie live-oak are seldom more than six or seven feet above ground.) The outer ends of the very numerous live-oak roots were still clinging by their long ramifications in the walls of the great pit all around, and the large tree was swinging securely upon this net-work of roots as upon a hammock. But where did the water, mound and ants all go to? was the question among the La Grange folks. The Colorado river passes in its deep channel three hundred yards distant from the ant hill, and the popular supposition was, that the mound, ants and all, had passed through their great tunnel, which they had previously excavated, into the river. Several years have gone by, and still when it rains the pond vents itself through that ant chasm, and the live-oak, though still green and thrifty, has settled deeper in the ground. I know of many other wells and tunnels that were made by the cutting ants, but as I have recorded a sufficient number of them here to establish these great works as a characteristic trait in their national action, it is deemed unnecessary to add any more.

All the sand and other material that is seen piled on the ant mound comes from the wells, tunnels and cells which are excavated for the accommodation of the ants. The work required to throw up these quite conspicuous mounds must have consumed many years, as well as an immense amount of labor. All the sand-carrying labor is performed by the smaller sizes of ants, principally by the very smallest. These are of a dingy brown color, and when crowded have a woolly appearance. These little fellows are lazy and extremely slow in their motion; seeming to perform their daily work with great reluctance. They are often found crowding in each others way about the gates of the city, and do not seem to feel any interest in what they are doing, which is to carry sand day by day. For their size they carry large loads, but they lose the advantage of the big loads by their slow motions. The larger types of this species, which move with greater celerity, pay no attention to the sand carriers, but pass out and in, walking over them and their big loads of sand as if they were the pavement. While I observe the slow, careless action of these lazy little mound builders, I cannot avoid the conclusion that they are slaves.

As the cutting ants perform their destructive works mostly during the night, I have not made sufficient observation on their nocturnal action to state certainly that they employ their slaves in the leaf-cutting business at all. They have large mandibles and sharp teeth, and I think it likely that they are capable and, perhaps, do participate in the labors and duties of all the departments in the national works. The cutting ants subsist entirely on the leaves of vegetables. They will eat the leaves of various trees, shrubs and some herbaceous plants. I have not observed them eating of any of the grasses. Sometimes during warm spells in winter when, as I suppose, their provision stores have run short, I have seen them cutting and carrying home the buds of the long moss (Tillandsia usneoides.) I think, however, that this alternative is resorted to only in periods of great scarcity; as I have never observed them collecting the moss during summer, or at any other time while the season of green foliage continues. They seem to have a regular and well disciplined corps of foragers,

and these, after a suitable tree has been selected by their scouts for them to work at, go forth about twilight and, ascending the designated tree, frequently the tallest willow-oak, (Q. phellos) commence the work of destruction. They cut the green leaves into pieces not much less than a five cent piece, and seizing it near one corner with their capacious mandibles elevate it, and tilting it backwards over the crown of the head, it falls edgewise between two strong spines, or horns, which stand erect at the back part of the forehead. Having their load thus adjusted, which, to the observer, seems to stand on its edge on top of the head and lengthways with the body, they hasten away to the appointed place of deposit. It is quite an interesting sight to observe with what precision and celerity they can edge their piece of leaf along amongst hundreds of their fellow laborers who are all carrying similar burthens, while they are meeting on the path an equal number of workers who are hurrying back to the tree empty.

They deposit the leaves on the ground at the place appointed for curing them, where they are left to dry in the sun through the succeeding day. Sometimes the new cut leaves are deposited near the entrance to the city; at other times they are strewed thickly along the path from the tree to the city; and not unfrequently they are thrown down in a pile near the root of the tree from whence they were taken. In either case they are left exposed all day in the sunshine; und they are, during the succeeding night, carefully gathered up and taken into the city; this rule obtains in autumn; they do not cure their leaves until towards winter. All summer time they are carried directly from the tree into the city. Whilst the dried leaves are being stored away, the foragers are engaged in cutting and laying out a quantity of fresh leaves, which undergo the same processes of curing and storing as the previous lot; and so on through the season for storing up food for winter. But should a shower of rain fall upon and wet the laid out leaves while they are out drying, it renders them unfit for food, and they are not stored. I have noticed many piles of these spoiled leaves rotting on the ground that had been damaged by being caught in the rain.

In my observations on the habits of the cutting ants, I have not discovered them eating anything besides the foliage of various plants. Neither have I ever noticed them carrying anything else into their cities. Prof. S. B. Buckley, who is a very close and accurate observer, states that he saw them carrying hackberries (Celtis occidentalis) and that they eat insects, tumble bugs, &c. The hackberry has a sweet pulpy covering, and I think it likely that if one of the leaf-eating ants was to find a hackberry, it would try to carry it home; but it being a perfect globe, a little too large for the span of its mandibles, I see not how it could effect it. As to their feeding on insects, I shall not pretend to deny it, for these wonderful, cunning and very sagacious ants doubtless perform many habitual actions that have passed unnoticed in my eighteen years observation.

It is stated that this species of ant does not lay up stores of provisions for winter supplies. I have not opened one of their cities during winter, and therefore cannot assert that they do. But from the immense quantities of leaves collected by them during the autumnal months, which are carefully sun dried and taken into the city, I should feel at a loss to say, if it is not intended for winter food, what other use they can put such quantities of leaves to; and furthermore, when it is known to be the kind of food upon which they subsist. It is also known that they construct cells from fifteen to twenty-five feet below the surface—below the line of change of temperature,—and in these deep subterranean apartments for their winter quarters, they would not become torpid, but would remain active. Now, if during the warm season it is necessary for them to consume the almost incredible amount of leaves which we see them daily carrying in, it becomes a matter of surprise—an unaccountable thing indeed—how they can make out through the winter months without anything to eat, when we know that they are not in a torpid state but lively and active.

In this vicinity within the last two years, (1861) the cutting-ants have greatly diminished. Many large cities have dwindled away to a few thinly populated holes; whilst many others are entirely depopulated. This, I think, is mainly attributable to the protracted dry weather. With many other species, particularly the agricultural and little black ants, long drouths seems to favor their increase. Not so with the cutting ant. They evidently decline. A seven years drouth would cause their wells to dry up as it did many of the wells belonging to the *genus homo*. I know of several very pretty homes that were evacuated the present year by human families, on account of the failure of their wells. Their wells dried up, and as they could not deepen them sufficiently to obtain a supply of water, they were obliged to leave their long cherished and well-fixed homes. The ants have done the same thing, and as I think for the same reason. Their wells also failed and they have perished for want of water, or have emigrated to districts more congenial to their peculiar mode of life. Anyhow, they have greatly diminished, and many large cities are actually depopulated and lying in ruins.

On the first of August, 1861, I discovered in a grove of thick timber and much undergrowth, a great many cutting-ant holes. They were all around in the bushes, extending perhaps over an acre of ground. They were all alike of recent date; their newly thrown up little heaps of fresh sand was what first attracted my attention. Finding them there on the hill-side, and actually boring holes in the thick woods, was a performance so entirely contrary to their customary habits, that I was led to the examination of the matter, and if possible to ascertain the cause of this strange unantlike proceeding. My first impression was, there being a large and very ancient city a few hundred yards distant from the new settlement, that it was the work of the recently thrown off queens from that old kingdom; that the young queens had stopped short in the shady woods in consequence of the hot dry weather, and were setting up for themselves in a new style, it being on a declivity and in a densely shaded woodland. I however excused them for all these flagrant deviations from their long established customs, by laying it to the continuous drouth and hot weather. I did not leave them until I had marked the place that I might visit them again, and find out how such a multiplicity of new settlements in so small a track of country would manage in the future. I then paid a visit to the large old ant city spoken of above. I had many times within the preceding twelve years, visited and made observations on its extraordinary public works. When I came there I was astonished to find that its inhabitants were all gone. I found only the large old mound of sand, now smoothed down by time's sweeping winds and the passing cattle, but there were no inhabitants—all had disappeared. They had evidently emigrated to the new settlements I had encountered down the hillside in the thick shady forest, and the inhabitants thereof were not, as I at first surmised, the newly commenced communities of the young queens, but emigrating parties who had gone out from the old city in search of water. Their wells having failed, they could no longer remain in the city, and having left it, had proceeded lower down the hill, and hoping to find water, were sinking many new wells. Subsequent observations have confirmed me in this opinion. The new settlements in a short time were evacuated. Having been unsuccessful in obtaining water at the new place, the ants had either died out or gone to some other district.

In accordance with my observations on this subject, I am forced to the conclusion that the drouth continued too long for them; that in districts where the wells are liable to dry up they often perish. I find that the kingdoms that are located near a constant stream, are in a flourishing state, and have continued so through all the time of the protracted dry season.

The cutting-ants plant seeds of various trees, vines and other plants. When they locate a city in bald prairie, which is often the case, where they cannot procure the seeds of trees, they cultivate the prickly poppy (Argemone Mexicana,) the most appropriate plant for their purpose that grows on the prairie.

The seeds of this poppy are planted over the greater portion of the crown of the city mound; the plant springs up during the autumnal rains, forms strong roots in the course of the winter, and by the time the sun becomes oppressively hot the next spring, it has grown up two or three feet high, with umbrageous green foliage and many large white flowers, and affords ample shade to the city.

When the ants locate a city on some sunny point near the timbered lands, they do not plant the poppy, but appear to prefer certain trees and vines for shade. For this purpose they plant the seeds of the prairie dogwood, (Viburnum dentatum), Yopon, (Ilex vomitoria), Hackberry tree, (Celtis occidentalis), Gum elastic tree, (Bumelia lycioides), the mustang grape, (Vitis Texana), Cocculus carolinus, and occasionally the prickly ash (Xanthoxylum fraxinium.)

It is often seen in cases of long established cities, that grape vines spread themselves over the tops of the grown up shade trees, and the large luxuriant foliage becomes so dense that it forms a shelter sufficient to turn a smart shower of rain. From the scorching rays of the sun these thrifty vines afford thorough protection.

Notwithstanding the notable fact that all the plants these ants cultivate, produce nuts, pulpy fruits and large seeds, I have not discovered that they make use of any of them for food. They appear to be a selection for shade, and so far I have not observed that they have any other use. If, however, after a more careful investigation it shall be discovered that they cultivate the vines, trees and fruitful shrubs for the double purpose of both shade and food, we must accord to them a share of sagacity and far-reaching forethought almost incredible.

I have occasionally discovered colonies of small sized red ants, which in form resemble the smallest type of the cutting ants. They dwell in the ground. I have not seen them cutting or carrying leaves. I have observed them thickly covering a greasy rag, places where syrup had been spilt, and where coffee grounds had been thrown aside at my hunting camps. They are not often met with, and, as I now think, never will be, so long as the superior and very numerous race of cutting-ants inhabit the land.

The smallest type found in the cities of the cutting-ants, which I have before alluded to as being slaves, are in shape, size, color, and all their peculiar motions, precisely the same. How happens it that the same species of ant should occupy two very distinctly marked conditions? In one he dwells in small colonies, makes very little mark, is never wealthy, and does not remain long at the same station. In the other he is a slave!

How the cutting-ant manages to make slaves of the smaller race is as yet an unsolved question. The cutting-ant does, to be sure, perform all his thieving operations at night, or by the aid of an underground passage, if in the day time. Consequently our observations on the mode of carrying on the slave-trade must necessarily be tedious and limited. But the cutting-ants have what I take to be slaves in great numbers; and the same type that constitutes their slave population, is found sometimes free, but very poor and in straggling communities.

The fact that these little sand-carrying ants are a servile race, I think cannot well be denied. If they are produced from the eggs of the cutting-ant by a peculiar process of feeding, as is the case in producing the various types found in a community, or hive of honey bees, then the conclusion will follow, that there are no proper communities of the smaller type, and the little nests that I have occasionally seen of them, were nothing more than companies of badly managing absconded slaves.

26th February, 1861. There was a heavy rain last night. To-day it is very clear and pleasant; thermometer 70°. Everything that has life in it or can grow is in motion. I was out on the prairie botanizing, and while resting in the shade of a large live-oak which was nearly in full bloom, I discovered great numbers of all sizes of the cutting-ants ascending and descending the tree. On the ground beneath the tree were thousands of the ants carrying

pieces of the leaves of various plants. The greater portion were carrying the leaves of the live-oak. Some of the leaves were faded and nearly dry, and all were the growth of the previous year. Seeing no ant hill near I undertook to find out how far they carried their leaves through the thick grass. In a short time I discovered that they carried them above ground but a small distance to a little pile of leaves and trash, under which they went dragging their cut leaves with them. Turning up the little pile of leafy trash, which seemed to have been driven there by the winds, in a depression of the ground that was probably an old horse track, there was a hole a full inch in diameter. Not a particle of dirt had been thrown out around it, and yet the hole was large and slanted away to the northwest. There were thousands of the ants at work in the shade of the live-oak, gathering up the leaves that were being constantly cut down from above, and on closer scrutiny I found several other holes into which they were going with leaves. These holes also slanted off under the surface, but had no earth thrown out around them, and were all alike concealed with leaves and little sticks. All the holes were crowded with the ants going in with leaves, or coming out empty. With such a number of ants and so many holes one would expect to find heaps of earth piled out around them, but such was not the case. The holes were the outer termini of the subterranean passages they had run out from their city, about fifty yards distant, and piled on their city mound lay the sand that came from the passages. These passages, or tunnels, are constructed for the purpose of avoiding the almost insurmountable difficulty they would have to encounter in the effort to carry their leaves through the tangled grass; and also apparently to make it possible for them to obtain food in times of scarcity during the cold weather. The cutting-ants are very easily stiffened with the cold air, and cannot succeed in scrambling through fifty yards of thick grass with a leaf of a cold day. But with the underground roads, in almost any kind of weather, they can go to the terminus, hastily run out and snatching up a recently fallen live-oak leaf, take it home through the tunnel without difficulty.

I saw the ants carrying nothing but leaves during this day's observation, neither have I ever observed this species collect any other kind of food except small flowers and the petals of larger ones; but these are no more than tender leaves.

At the ant city there appeared to be a great turn out of the ants this fine day. I noticed four sizes of them. Most of the slaves were engaged packing out sand upon the city mound. There were, however, a considerable sprinkling of them in company with the larger sizes packing leaves. I noticed also a great number of their giants, walking to and fro with the laborers, but they performed no work that I saw. The giants are large, and have a large head with strong mandibles. They are well-formed for the execution of much of their kind of labor; but I did not discover that they did any work, though they were passing up and down the tree and along the road with the laborers all the time. All the small ones—the slaves—and the second sized ones—which may also be slaves—were unremitting in their labors. The third size, or class, also carried leaves quite busily.

This species of ant often carry their subterranean roads to the distance of several hundred yards from the city in grassy districts, but where the grass has been destroyed, they do not construct the underground passages, but travel over land in nicely cleared out roads, which are seen radiating from the city mound and extending to various trees, or spots of herbage which produce suitable leaves for their subsistence. To see one of these well-cleared roads extending in a continuous line from the city to some tree or garden two or three hundred yards distant is indeed remarkable. This fact, in a district nude of grass, occurs so often that it cannot be attributed to chance, or blind instinct. Some of the engineers in their excursions in search of supplies, often wander to the distance of four or five hundred yards, or even further, and finding a plentiful source of good food, would find no difficulty in con-

ducting parties the best route to it; and soon a good smooth road is constructed, over which in crowds the workers are seen through the night, or in cool cloudy days, transporting the leaves to the city. This is their mode, invariably, in a country where the grass has been destroyed, and we can see and understand the method and the purpose for which they work. But in a country which is heavily coated with high grass, it is not so easy to discover by what process they lay off a tunnel and successfully carry it in a direct line to the selected tree or garden spot a quarter of a mile distant, and sometimes beyond a considerable streamlet of running water.

On one occasion, on a log that lay across the Ye Gua Creek, the ants passed over to a gentleman's garden and were rapidly cutting his vegetables to pieces. The owner hoping to rid the garden of these troublesome insects, cut the log away and it floated off down the creek. He was mistaken in his calculations, for it was but a few days after when the ants were ravaging the garden in as great numbers as they were previous to the removal of the log. After searching unsuccessfully for some interlocking tree that might afford them a passage, it was observed that the ants came out from several holes, situated on the creek side of the garden. Subsequently it was discovered that, on a large ant mound crowning a sandy point near the edge of some post-oak timber, two hundred yards from the creek, there were quantities of the black soil of the Ye Gua bottom thrown out, proving that the second visit of the ants to the gentleman's garden had been effected by a tunnel beneath the bed of the creek; the channel of the creek, at that place is fifteen or twenty feet deep, and from bank to bank on top of the bluff about thirty feet.

By what degree of the *instinctive* powers was all this engineering and truly great project accomplished.

I have never seen the cutting ants fighting among themselves, or with any of the other species. I look upon them as the most peaceable, the most sagacious, and at the same time the most destructive of the ant kind.

March 5th.

The President, DR. HAYS, in the Chair.

Thirty-six members present.

The following papers were presented for publication:

"On the Structure of Lopezia." By Thomas Meehan.

"Mammalogical Notices." By J. H. Slack, M. D.

March 12th.

MR. CASSIN, Vice-President, in the Chair.

Forty-two members present.

The death was announced of Prince Maximilian, of Wied, a Correspondent.

The following was presented for publication:

"The necessity of Nebular Rotation." By J. Ennis.

Prof. Cope exhibited the fossil skull of a large turtle, from a soft granular limestone belonging to the cretaceous formation of Barnsboro, Gloucester Co., N. J. It was characterized under the name of Euclastes platyops. The length of the skull is 11 inches; its breadth 8½ inches.

March 19*th*.

The President, DR. HAYS, n the Chair.

Thirty-nine members and correspondents present.

The following were presented for publication:

"On Euclastes, a genus of extinct Chelonidæ." By E. D. Cope.

Prof. Leidy exhibited a number of plates of a forthcoming work on the extinct mammals of Nebraska and Dakota, comprising about seventy species. Among these he exhibited the representation of a skull of a new ruminant which he characterized under the name of Agriochoerus latifrons.

In answer to a question, Prof. Leidy remarked that he had never detected the slightest evidence of the former existence of the Hippopotamus in America. Remains reported as such had turned out to be inferior tusks of Mastodon, &c.

Prof. Cope presented to the Academy a young specimen of the whale, known as the Bahia Finner, procured near Bahia, Brazil, the length of which was 21 feet. He said it belonged to the genus Megaptera, Gray, with the hunchback whales of sailors. The evidence consists in the very short di- and parapophyses of the cervical vertebræ and the absence of all trace of acromion and coracoid processes. The orbital processes of the frontal are narrowed externally and the muzzle considerably narrowed. Judging from the name, it possesses a more fully developed dorsal fin than the other Megaptera. It should be called Megaptera braziliensis.

A letter was read from Prof. J. P. Kirtland, of Cleveland, Ohio, giving an account of the death of Major Robert Kennicott, which occurred on the 13th of May, 1866, at Nulato, on the Yukon River, 600 miles above its entrance into Behring's Sea.

March 26*th*.

The President, DR. HAYS, in the Chair.

Thirty-nine members present.

The resignation of membership of O. N. Barnes was tendered and accepted.

The death was announced of Washington L. Sherman, M. D., U. S. A., a member, on May 4th, 1865.

The following were elected members:

Samuel Ashhurst, M. D., Francis Ashhurst, M. D., Rev. I. L. Beman, Charles Smith, Thomas Earp, Charles Taylor, Moro Phillips, Samuel Welsh, Lewis Cooper, Benjamin B. Comegys, S. C. Morton, Mrs. E. P. Long and Miss Bohlen.

The following were elected correspondents:

Hon. George P. Marsh, Florence, Italy; Dr. Gideon Lincecum, Long Point, Texas; John R. Willis, Halifax, N. S.; and Samuel H. Scudder, M. D., Boston, Mass.

On favorable report of the respective committees the following papers were ordered to be published:

On the Structure of LOPEZIA.

BY THOMAS MEEHAN.

Lopezia, with its single stamen, is considered as an anomaly amongst onagraceous plants; but an analysis of L. miniata, *D. C.*, shows the structure to be on the same regular plan with the rest of the order. The genus is described as having a four-cleft calyx, which for practical purposes it may be considered to have,—but two of the segments evidently belong to the corollate system, and two of the petals to the staminate axis, making the arrangement, from a structural point of view, to be a two-cleft calyx, four petals, and four stamens.

It may be well to observe here, that in consequence of the spiral nature of the growth of plants, the different parts of what we term the same axis are not developed simultaneously. Stamens, petals, sepals and leaves, are, therefore, though apparently from the same axis or verticel, rarely of the same size or form, and perhaps a careful microscopic examination might show that they never are. We may assume that the parts of the verticel which have the priority of development, will have at times a mechanical as well as physiological influence on the form or direction of the later and weaker parts; and when the contraction of the spiral line is very rapid, and the axes of the different verticels brought in close contact, the lowermost and strongest influence the one above.

This influence is clearly traced in Lopezia. Lindley remarks (*Vegetable Kingdom*, page 724) that "there are really two stamens, one perfect and bearing an anther, the other sterile and in the form of a spoon-shaped petal." This spoon-shaped petal is evidently of the same axis, but with a priority of development, which enables it to grasp with its lamina the anther of the weaker stamen. In its expansion it thus draws the stamen down with it, which, in turn, grasping the pistil by a winged filament gives an irregular direction to the central axis by this simple mechanical means. The progress of this development is very interesting. The lamina of the sterile petal grasps the anther till long after the pollen sacs have burst, and remains fast in its hold until some insect or other external agency touches the petal, when the stamen is released with great force, and the petal springs backwards instantaneously on to the already expanded and spreading calyx, and the stamen at the same time bends back in an opposite direction, scattering its pollen on the back of the insect or the other disturbing cause. If this liberation has not been effected at an early age, the stamen flies back at once into a position regularly corresponding to the sterile petal on the opposite side; but if early the grasp it has on the pistil by its clasping filament prevents it doing so. The whole arrangement with the progress of the development seems the most effectual contrivance that could possibly be devised to prevent a flower from fertilizing its own stigma.*

Beneath these two stamens are two gland-bearing petals, which the analyzer will have no difficulty in deciding to be two stamens early developed, and partaking, in consequence, of a petaloid character. By the overlapping of the bases when young these have been pushed out so as to be finally developed in one direction, and beneath them are two perfect petals, also twisted to go in one direction by the same law.

We now come to the four-cleft calyx, and we notice that no sooner are the segments fairly expanded than the two weaker ones take the direction towards each other which characterizes the sets above them, leaving the two-cleft calyx to hold its position unchanged as such. These petaloid sepals have evidently been brought down to the position of the true sepals mechanically, by a temporary cohesion. If we assist very lightly a flower to open it bursts easily into two parts, almost precisely like the two-cleft calyx of Circæa, its

* This elasticity has been noticed in *Lopezia racemosa*, Cav., by Curtis in Bot. Mag. t. 254.

next affinity, showing clearly that its most natural division is on the binary plan.

It may be further noted in regard to *Lopezia miniata*, the only perennial suffruticose species I believe, that the smooth stem, which is considered a good character in distinguishing it, is only extant while the plant is in a flowering state. It has two distinct systems of growth. During the earliest it is as hirsute as the other species; at the conclusion of its early summer growth it starts anew with a growth which ultimately flowers, and it is this only which is destitute of hairs.

These notes are made from cultivated plants.

MAMMALOGICAL NOTICES.

BY J. H. SLACK, M. D.

ANTHROPOPITHECUS TSCHEGO.

Troglodytes tschego Duvérnoy, Arch. du Mus., vol. ix. 1857.

Troglodytes calvus Du Chaillu, Proc. Bost. Soc. Nat. Hist., vol. vii. p. 267, 1860.

Size about equal to that of the *Anthropopithecus niger*. General color black, sometimes grey in old age. Head bald, black and shining; chin of adult bearded. Ears large, much larger than those of the *Anthropopithecus gorilla*, though smaller than those of the Chimpanzee.

Habitat.—The deep forests, and the table lands of equatorial Africa.

Figure of skeleton, Duvérnoy, Arch. du Mus., vol. ix.

Figure of entire animal, Du Chaillu, Equatorial Africa, p. 406.

A fine adult skeleton of this rare anthropoidal ape, first noticed as a distinct species by the late lamented Duvérnoy, has been for some time in the collection of the Academy, and has been regarded until lately as that of the *A. niger*. For a full account of the osteological difference between the two species, I must refer to Duvérnoy's most valuable and interesting paper; though, on placing the skulls of the two animals side by side, their specific differences must be apparent to the most superficial observer.

A careful study of the species appears to me to clearly prove the fallacy of regarding the *A. gorilla* as the type of a distinct genus, as has been done by St. Hilaire, the *tschego* combining in a remarkable degree the characteristics of both genera. The cranial crests, so much insisted on as generic characters of the *gorilla*, are to be seen, though in a less degree of development, in the *tschego*, while with the black face of the *gorilla* are associated the large ears of the chimpanzee, and, in fact, all the characteristics of the animal are intermediate between those of the two genera. The names tschego, nshego and nchéko appear, from the accounts of travellers, to have been applied indiscriminately by the natives of equatorial Africa to all species of anthropoidal apes.

To this species has been ascribed the faculty of constructing a nest or shelter among the higher branches of trees, as a protection from the inclemency of the weather during the rainy season. This, according to Du Chaillu, (Equatorial Africa, p. 407) is covered with leaves, compactly laid together, at such an angle as to readily shed the rain. The branches are fastened to the trunk of the tree with vines; the roof is generally from six to eight feet in diameter. Surely this roof-constructing power must place its builder the highest in the scale of the quadrumana.

The only figure of this animal in the flesh that I have met with, is to be found in Du Chaillu's work. The so called young in the same plate, however, resembles in a most remarkable degree a daguerreotype from life of a young *A. niger*, which died some years ago in the Jardin des Plantes at Paris. It must therefore be received "cum grano salis."

I have accepted for the genus the name given by De Blainville in his lectures, 1839, and quoted by Sénéschal (Dictionare pict. de Hist. Nat., article Quadrumana, 1839; Hollard, Elem. de Zool., 1839; Pouchet, Zool. Class., vol. i. p. 39, 1841, et al,) as not only being much more appropriate for a genus of animals living among the branches of trees, but also as the name *Troglodytes* is preoccupied, having been given to a genus of birds by Vieillot (Oiseaux de l'Amerique Septentrionale, p. 52, 1807) five years previous to its having been bestowed upon this genus of mammalia by Etienne Geoffrey St. Hilaire (Tableau des Quadrumanes, Annales du Mus., 1812).

A. tschego—entire skeleton.

Specimen No. 564.

Muzzle to last cervical vertebra	14·
" " dorsal "	21·7
" " lumbar "	24·5
" tip of great toe	59·5
Height	46·
Arm	31·
Leg	26·
Humerus	11·5
Femur	11·
Hand	8·5
Foot	6·25

From materials in the collection of the Academy I am enabled to present the following table of measurements of the skulls of the allied species of the genus *Anthropopithecus:*

The method of measurement adopted is that suggested by Dr. J. A. Meigs, in his paper "on the Measurements of the Human Skull."

	No. 564. Name. A. tschego.	No. 156. Name. A. niger.	No. 155. Name. A. niger.
Occipito-frontal	5·	5·45	5·28
Frontal	4·2	4·2	4.45
Bi-temporal	3·7	3·7	3·8
Bi-parietal	3·4	3·7	3·75
Frontal arch	8·2	8·8	8·8
Parietal arch	9·2	10·	10·
Occipital arch	7·2	7·9	7·75
Horizontal periphery	6·25	6·75	6
Meato frontal	3·75	4·2	4·2
Meato parietal	1·9	1·8	1·8
Meato occipital	3·	3·	3·
Meato malar	2·7	3·	3·
Meato alveolar	6·5	6·	6·
Nasal alveolar	2·2	2·2	2·2
Bi-zygomatic	4·1	4·5	4·2
Facial angle	50°	47°	45°
Cranial capacity	22 in.	20 in.	20 in.

CYNOCEPHALUS DOGUERA, Pucheran and Schimper, Rev. et Mag. de Zoologie, 1856, p. 96; 1857, p. 57.

General color olive-brown, the brown predominating on the body and external surface of posterior limbs; hands very dark brown, nearly black; sides of head, belly, and internal surface of limbs yellowish-white, the hairs of body annulated with alternate bands of black and brownish-yellow, the brown predominating upon the tail, which is terminated by a long tuft of hairs. Face naked.

Habitat.—Central Abyssinia.

Measurements.

1013. Mounted skin, ♂. Abyssinia.

From tip of nose to eye	5·
" " ear	8·
" " occiput	13·4
" " tail	38·
Tail to end of vertebræ	19·
" " hairs	22·
Length of fore foot	20·
" hind feet	19·5

The specimen in the collection of the Academy above described was obtained by me for the institution from Messrs. Verreaux freres, of Paris, in 1861. It, with the type of the species, now in the magnificent collection of the Jardin des Plantes, was brought by Mr. Schimper from Central Abyssinia about the year 1855. These two specimens are, as far as I am aware, the only ones known to naturalists. Both are full-grown males.

M. Schimper states that the animals of this species are gregarious in their habits, he having met with them in troops of from one to two thousand individuals. They hunt their prey, which consists mainly of the small ruminants, in a manner similar to that of a pack of hounds; following the quarry until it is exhausted by fatigue, and then capturing and devouring it. Similar habits have been ascribed by travellers to the *C. porcarius*. It is also stated that the lion and leopard are unknown in the region inhabited by this baboon. A glance at the specimen under consideration would convince the observer that it is of a most ferocious disposition; the large canines and heavy lower jaw would be useless to an animal of quiet and peaceful habits, and, in fact, M. Schimper also informs us that it wages a continual war against the *Dschellada* (*Theropithecus gelada*),* which inhabits the same locality.

The only baboon with which this species can be confounded is the *C. porcarius*, the form, size and habits of the two species being somewhat similar; but they can readily be distinguished by their coloration, the *porcarius* being much darker.

I have not been able to compare the skulls of the two species, but from an examination of the only specimens known, both being mounted skins, it would appear that the occipito-mental diameter of the skull is proportionately much greater in this species than in the *porcarius*.

Mycetes palliatus Gray, Proc. Zool. Soc. 1848, p. 138, fig. vi.

Under this name Dr. Gray has figured and described a monkey from South America, which presented most certainly all the characters required for the formation of a new species, though the specimens were young; still the long hair of the back and the coloration were very different from any of the known South American quadrumana. Having received four specimens from the Smithsonian Institution which had been collected by the Atrato Expedition, I accepted the species in my Monograph of the Prehensile-tailed Quadrumana (Proc. A. N. S. 1862, p. 519). I have since had an opportunity of examining other specimens from New Grenada, and have discovered, to my surprise, that it is merely the young of the *Alouata niger*. When very young the animal is of a pale straw color, passing through all the intermediate shades of coloration in its pelage during its youth, and in adult age becoming entirely of an intense black color. The coloration of the *palliatus* is that of the period of the commencement of the second dentition.

MACACUS FUR, sp. nov., vide plate.

General color reddish-brown, dashed with black, the hairs of the body and external surface of limbs being black throughout the basal two-thirds of their

* A fine suite of specimens, male, female and young of the *T. gelada* have been obtained from M. Verreaux, and are now in the Museum of the Academy.

length, and tipped with reddish-brown; breast, belly, and internal surface of limbs grey, somewhat darker on posterior limbs; tail, a tuft of hairs on the superciliary ridge, and a line extending from the external angle of the eye to base of ear, black; tail long, about equal to the body in length; hands dark brown; fingers black; hair of occiput laying flat, neither forming a crest nor radiating from a common centre.

Measurements.

Specimen No. 1254. Philippines. ♂.

From tip of nose to eye	2·
" " ear	4·
" " occiput	8·
" " tail	23
Tail	22·5
Length of fore feet	11·
" hind feet	13·

Skull (occiput broken). Bi-temporal, 2·3; bi-zygomatic, 2·7; fronto-mental, 3·2. Lower jaw: angle to symphysis, 2·6; angle to condyle, 1·2.

This *Macaque* was obtained for the Academy some years since in Paris, by myself, and as great confusion occurs in regard to the species of this genus, I would have had great reluctance to describe it as a new species, had I not had the opportunity of comparing it with the various specimens in the great museums of both Paris and London.

The only previously described species of *Macacus* with long tails, and without radiating hairs or crests upon the top of the head, are the *M. aureus* (*Is. Geoff.*, Voy. de Belang. 1830), of which the general color is pale reddish-yellow, with limbs grey on their external surfaces; the *M. cynomolgus* (Desmarest, Mammalia, p. 65, 1820, *Simia cynomolgus* Linn.), which is olive, dashed with black, and tail much longer than the present species. The locality is also different. I have examined specimens of the *cynomolgus* from India, Bengal, Mauritius, Java and Sumatra, but have never met with one from the Philippine Islands; the *M. palpebrosus*, which is thus described by St. Hilaire (Cat. des Primates, &c., Paris, 1851, p. 93): "Les paupières sont blanches, ainsi qu'une tache placée de chaque côté au dessus de la paupière, et contrastant avec la couleur foncée soit de l'espace intermediére au deux taches, soit de la face;" and an albino specimen in the museum of the Jardin des Plantes, described by St. Hilaire as *M. Philippinensis* (Arch. du Mus., 1843, t. xxxii. p. 568), which presents no distinguishing specific characters, —the form of the head being, however, entirely different from that of the *M. fur*.

I have been informed by M. Jules Verreaux, who has spent some time at the Philippine Islands, that this animal is found only on the island of Luzon, and is there, unfortunately for the inhabitants, quite common. Though inhabiting the mountains and dense forests in the interior of the island, they frequently make nocturnal excursions to the sea-coast in large troops, utterly destroying the crops planted by the natives, especially those of turnips, a root of which they appear to be particularly fond. The specific name is bestowed upon them on account of their thieving propensities. Their flesh is eaten by the natives, and considered a great delicacy.

GALAGO ELEGANTULUS Slack, Proc. A. N. S. 1861, p. 153.
Microcebus elegantulus J. Le Conte, Proc. A. N. S. 1857, p. 10.
Galago crassicaudatus Gray, Ann. Mag. Nat. Hist. vol. viii. 1861, p. 63.
Otolicnus apacalis Du Chaillu, Proc. Bost. Soc. Nat. Hist. 1861.

General color dark cinereous, the hairs being tipped with reddish-brown and grey during the basal two-thirds of their length. Tail cylindrical and bushy, tipped with white.

Dr. Gray (loc. cit.) regards this species as identical with the *Galago crassi-*

caudatus of Etienne St. Hilaire (Ann. du Mus. 1812, p. 166). It is, however, in my opinion, entirely distinct. The specimen in the collection of the Academy, from the Du Chaillu collection, though adult, as may be seen by the examination of the skull, is at least one-third smaller than the typical specimen of the *G. crassicaudatus* in the Paris museum; the nose is more pointed, and the general coloration very different.

The white tip of the tail, which is considered by Dr. Gray as accidental, I regard as a well-marked specific character, it being plainly indicated in two very young specimens, presented to the Academy by Dr. H. A. Ford several years since. One of these is decolorized by having been preserved in alcohol; the other is entirely of a dark slate color, with the exception of the white apex of the tail.

A curious typographical error is to be found in Maj. Le Conte's description of this species: the head is described as 1 foot 9 inches in length; for "head" read—from muzzle to tip of tail.

DAUBENTONIA MADAGASCARENSIS Etienne St. Hilaire, Decade Philosophique, t. iv. p. 193, 1795.

Cheiromys Madagascarensis Cuvier, Anat. Comparée, vol. i. 1800; Dict. des Sciences Nat.

This most curious mammal, whose place in the scale of nature was for a long time a point of discussion between the most eminent European naturalists, and which, even at the present day, has been regarded by some as a rodent (vide Tenney, Natural History, &c., N. Y., 1865, p. 2, fig. 57), though the manner of growth of its incisors is entirely different from that of the rodentia, was first described by the elder St. Hilaire under the generic name of *Daubentonia*, in 1795. In 1800, Cuvier, who long held that the creature was a rodent, re-described it under the name of *Cheiromys*, *χειρ, manus; μυς, mus.* In the Diction. des Sciences Naturelles, 1816, Art. Aye Aye, he gives his reason for the change, made, it is said, with the consent of the original discoverer, in the following words: "Nous avons préféré Cheiromys, parceque l'usage de donner des noms d'homme n'est point recu en zoologie comme en botanique." Is this sufficient ground for a change? In our opinion certainly not, unless the absurd rule first promulgated by the French naturalists, which would compel us to "considérer comme non avenus (*toutefois en les citant en synonymie*) les noms tombés en désuétude" (*Is. Geoff.* St. Hilaire, Cat. des Primates, p. xi.,) should be generally adopted, which would still further confuse the work of zoological nomenclature, begun by Adam, and far from being completed at the present day.

April 2d.

The President, DR. HAYS, in the Chair.

Thirty-eight members present.

The following papers were presented for publication:

"On dioicœus forms of Vitis vinifera." By Thomas Meehan.

The death was announced of Dr. George Jäger, of Stuttgart, Correspondent.

April 9th.

The President, DR. HAYS, in the Chair.

Thirty-six members present.

The following papers were presented for publication:

"Description of New Texan Myriapoda." By Dr. H. C. Wood, Jr.

[April,

"On two new Minerals from Chester Co." By Isaac Lea, LL. D.

Prof. Cope exhibited several vertebræ of a Gavial from the cretaceous marl of Burlington Co., N. J., and proposed for the new species the name of Thoracosaurus brevispinus.

A letter was read from George W. Tryon, Jr., offering his collection of Shells to the Academy on certain conditions, which, on resolution, were accepted. The collection consists of over 10,000 species, in addition to 100 jars of alcoholic specimens, mainly of naked mollusca. The collection is particularly rich in recently described species.

April 16th.

The President, DR. HAYS, in the Chair.

Thirty-eight members present.

The death was announced of Dr. C. W. Pennock, on the 14th inst., a member.

April 23d.

The President, DR. HAYS, in the Chair.

Thirty-three members present.

The following was presented for publication:

"A third study of the Icteridæ." By John Cassin.

The death was announced of Mr. Samuel C. Morton, a member.

April 30th.

The President, DR. HAYS, in the Chair.

Thirty-three members present.

The following were elected correspondents:

Col. F. F. Cavada, U. S. Consul at Trinidad; Eugene Gaussoin, of Baltimore; Alpheus Hyatt and F. W. Putnam, of Salem, Mass.

The following were elected members:

Wm. Hay, James H. Little, Beauveau Borie, J. Ross Snowden, Wm. W. Keen, Jr., M. D., Edward J. Nolan, M. D., Charles Magarge, Charles S. Coxe, Isaiah V. Williamson, Matthew Baird, Charles Wheeler, Robert H. Gratz, Adolph E. Borie, H. Pratt McKean, Geo. F. Tyler, Wistar Morris, Joseph F. Page, Israel Morris, A. Campbell, Thomas A. Scott, H. H. Houston, Charles Spencer, Gustavus S. Benson, Wm. A. Blanchard.

On favorable report of the respective Committees, the following were ordered to be published:

On EUCLASTES, a genus of extinct Cheloniidæ.

BY E. D. COPE.

This genus is established on a species represented by a single imperfect cranium, procured by Thos. Heritage from his marl excavations near Hurffville, in Camden Co., N. J. The matrix in which it is preserved is very simi-

lar to that near Vincenttown, in which the cranium of the Thoracosaurus neocæsariensis was discovered, being a coarse granular limestone in many places, with numerous black rounded grains of perhaps phosphate of iron or hornblende. It is abundantly penetrated by Teredo tibialis Mort., contains Gryphaea vomer abundantly, and has afforded the only specimen of Aturia from the eastern cretaceous beds, which I have called A. paucifex.* The bed is but a few inches thick, and is frequently interrupted, and is over and underlaid by the green sand of Cook's middle bed.

The physiognomy of this large turtle, in the obliquely expanded zygomata and short muzzle, is like the Pleurodire genera Podocnemis Wagl. among recent Chelonia, and Bothremys Leidy, of the same age, among extinct forms. Its completely overarched temporal fossæ add to the impression of its affinity to the former genus, but on inspection of the vomer, it is found to be, as in the true Cheloniidæ, largely developed on the palatal surface between the o. o. maxillaria, and to extend to a posteriorly situated nareal opening. Though this element is unossified in the Chelonioid types of Pleurodira, Peltocephalus and Podocnemis, it is well developed in the family Chelydidæ (Agassiz), and the peculiarity of the cretaceous species might still exist in this sub-order. As it is a matter of much interest to determine the precedence in time of the two sub-orders of Chelonians, I have taken pains to remove the matrix from the orbital and nasal cavities, so as to determine the structure of the prefrontal bone. As I have elsewhere pointed out, this sends downward a column to the vomer, either vertically or directed obliquely inwards, in all the Cryptodira, while in the Pleurodira the column is wanting.

It might be reasonably anticipated that, in the period of the Cretaceous, the less typical sub-order now characteristic of the Southern Hemisphere would abound, if not entirely prevail. Its genera occur in the different epochs of the Jurassic period, and Prof. Agassiz suspects one, at least, of the Cretaceous Cheloniæ of Europe to be really Pleurodire. The species herein described, however, I must refer to the true Cheloniidæ, and consider it as an undescribed genus, having marks of resemblance to the Trionychidæ and Hydraspididæ. It differs from Chelonia in its large naso-palatal foramen, thus resembling Trionyx, in the complete flooring of the nasal meatus by the vomer and palatines as far back as the line of the inferior openings of the orbits, and by the shallowness of the palate and slight developement of the alveolar margin.

The diagnosis will be as follows: that of Bothremys a Hydraspid, which has furnished the only other cranium from the same formation, is introduced. It also has the vomer osseous, extensively in contact with the maxillaries on the palatine surface.

Bothremys Leidy. Posterior nares separating vomer from o. o. palatina; premaxillary margin concave, involute; alveolar surface profoundly concave, vomerine surface a sulcus. Nasal meatus floored in front.

Euclastes Cope. Maxillaries and palatines separated throughout by the prolonged vomer; posterior nares opposite palatal front margin of orbits; premaxillary margin projecting, beak-like; alveolar face little concave, vomer forming a central ridge. Floor of nasal meatus perforate for hook of mandible.

While Bothremys had an inferior mouth and projecting muzzle, as in the modern Hydraspides, the nostrils of the Euclastes were superior and behind the short projecting beak. The orbits are not, as in the Macrochelys of the Mississippi, far anterior and reduced in size, but their centres are distant from the end of the muzzle (measured axially) more than one-third the total length of the cranium.

The descending portion of the prefrontal is very wide, and equal to the width

* Proc. Academy, 1866, p. 3.

of the maxillary outside the lachyrmal foramen; the latter is small. Internally the columns of the prefrontals converge below to nearly an acute angle, and are directed forwards along the vomer. They restrict the nasal meatus extensively, leaving its diameter less than that of the columns. On the muzzle the prefrontals have but a short common suture, admitting the frontal far between them. The internal nostrils have a diameter each side the septum, equal to that of the meatus between the prefrontals.

EUCLASTES PLATYOPS Cope.

Premaxillaries narrow, rounded in front, maxillary outline nearly straight to below anterior rim of orbits, where the breadth of the muzzle is four inches, length to end of muzzle only two. Plane from top of prefrontals to maxillary margin straight, oblique. Maxillary margin with a gentle sigmoid flexure. Squamosal much expanded below and behind orbits. Frontal region flat, parietal rising behind. Nasal meatus subquadrate, slightly narrowed below, its palatal foramen with a free lateral osseous margin. Alveolar ridge divergent, little projecting above the oblique surface; the latter is most concave behind on each side the vomer, and presents no ridges, and few nutritious foramina. Line of common suture of o. o. maxillaria in front of vomer, in a sulcus. Palatines cuneiform with everted margins posteriorly, latter most elevated on each side the small choanal opening, which is bounded in front by the projecting posterior knob of the vomer. The maxillaries are very massive, and underlie more than two-thirds the area of the orbits; they receive a very extensive descending portion of the prefrontals, their union extending so far towards the median line as to leave but a narrow nasal meatus. This offers a powerful resistant face to the motion of the mandible. The posterior, orbital margin is ·75 inch in thickness, and is at right angles to its alveolar margin. Pterygoids almost entirely broken away. The following measurements will furnish the best data for a comprehension of the form in detail:

	In.	Lin.
Total length cranium	11	
Breadth behind orbits	8	6
" between posterior margins orbits	5	2·5
Least interorbital width	2	2·5
Width of nasal meatus	1	2·5
Depth premaxillaries	1	1
" maxillary at middle orbit	1	3·5
" squamosal at zygomatic arch	2	2
Length naso-prefrontals	2	3
" " common suture		6·2
" common suture frontals	2	4
" from anterior margin orbit to nasal meatus		11
" from premaxillary margin to end vomer	3	9
Width posterior nares together	1	1·5
" palatine bone opposite end of vomer		9
" vomer near anterior extremity		7
Greatest diameter of orbit	2	6
Least " "	2	

The broad, regular alveolar surfaces have no doubt supported a massive corneous table, in some degree like that of Platypeltis f e r o x, and with little or no external cutting margin. This arrangement, as well as the compactness of structure, is appropriate to a nutrition dependent on crushing more or less hard bodies, as molluscs. That the Ostreæ, Terebratulæ, etc., of the sea coasts or estuaries in which it lived formed much of its food, is therefore quite probable.

Estimating the proportions to have been similar to those of Hydraspis m a x i m i l i a n i, the dimensions of the Euclastes p l a t y o p s were—

	Ft.	In.
Length from end muzzle to end tail	6	7½
" of carapace	4	7
Width of plastron at middle	3	0½

Note on Dioicœus forms of VITIS VINIFERA, L.

BY THOMAS MEEHAN.

The different species of *Vitis* are so closely allied that the systematist is often puzzled to find distinguishing characters, and hence liable to give too much importance to points really of little value.

De Candolle, in his Prodromus, divides *Vitis* into two sections, according to the inflorescence,—one, natives of this country, with imperfect flower (*Dioicæ aut polygamæ, Americanæ*); the other, perfect and Old-world forms (*Hermaphroditæ, in orbe veteri indigenæ*),—but as *Vitis* is not of a true declinous type, but of that class which suppresses or develops its sexual organs according to circumstances, such a division is at best of doubtful value.

Vitis vinifera, the great type of Asiatic forms, has not probably been observed closely in a natural state; and under cultivation, in the hands of cultivators who value the vine for its fruit only, barren plants would not likely be preserved. Yet pistillate or female plants do not seem uncommon, for De Candolle says (vol. i. p. 633,) "Seminibus numero variis imo interdum omnibus abortivis," these seedless grapes being most likely the product of unimpregnated ovaries.

That male plants do exist is, however, proved by a specimen, in the Academy's Herbarium, of *Vitis vinifera mascula*, gathered near Naples by Tenore.

In the endeavor to distinguish forms of *Vitis vinifera* from American species, its hermaphrodite character is still often insisted on; but with the demonstration of the existence certainly of male flowers, and the probable existence of female ones, this distinction becomes too uncertain to be of much value.

Descriptions of new species of Texan MYRIAPODA.

BY DR. HORATIO C. WOOD, JR.

Genus CERMATIA.

C. Lincecii.

C. dilute brunnea, linea mediana saturate viride et alteris lateralibus interdum obsoletis ornata; stomatis dorsalibus singula maculis duis laete rubris marginata.

This handsome species is of a brownish color, with the dark green median stripe often involving nearly the whole of the posterior portion of the dorsum. The lateral stripes appear to be sometimes wanting. The head is marked much as in *C. forceps*; in the dried specimen it is of a nearly uniform reddish ferruginous color. The scuta are roughened with rather distant small spines; their margins are thin, elevated, without conspicuous spines. The antennæ are of the same color as the head, as indeed are all of its appendages. The spots bordering the dorsal stomata are somewhat kidney-shaped, and of a scarlet lake color.

The under surface of the body, the coxæ and femora, are of a light brown color. The tibiæ and tarsi are of a dark greenish tint. The metatarsi are of nearly the same tint as the head; the first article is about equal to the next five in length. The sterna are rather deeply impressed with a median longitudinal line. The body of the largest specimen in my possession is about seven lines in length.

The foregoing description is taken chiefly from dried specimens, in which the coloration, I presume, does not differ materially from that of life.

Dr. Lincecum states, in his letter accompanying the specimens, that their favorite haunts are under stones, in hollow logs, and especially about unused fire-places. He also says that they are not half the size of *C. forceps*. In dedicating this species to Dr. Lincecum, I do it as a well merited token of respect for his untiring zeal as a field naturalist, and for the liberality with which he furnishes others with the results of his own industry. I am indebted to the Doctor for all the species described in this paper.

Genus POLYDESMUS.

P. IMPURUS.

P. dilute brunneus fusco variatus; scutis rubro marginatis; scuto anale triangulare, apice elongato truncato; appendicibus masculis, robustis, spina terminale haud pilosa.

The color is a light brown, finely mottled with dark brown, the dark color predominating in the central portions of the scuta, the light on the lateral parts. The scuta are ornamented with a narrow reddish flesh-colored line both on their posterior and lateral margins, which is, however, more pronounced on the lateral margins; the first scutum has a similar line on its anterior margin. The vertex has a strongly pronounced median line. The antennæ are filiform, somewhat pilose, and like the ventral surface and pubescent feet, a light yellowish brown. The male appendages are robust, their blunt distal end is covered with long hairs, and gives origin to two spines, neither of which are hairy; the larger of these is regularly curved, except at its extreme point, where it is abruptly bent; the other is slender, curved, and acute. The total length of the body and head is about an inch.

This species is closely allied to *P. hispidipes*, differing from it, however, in coloring and in the form of the genital appendages. I have not examined any females. Dr. Lincecum informs me that it is rare in Texas, especially in dry seasons, and is found chiefly under old cow dung. Its favorite haunts suggested its name, although it is one of our handsomest species.

Genus IULUS.

I. CÆSIUS.

I. cæsius, brunneo annulatus; antennis filiformibus, modicis, pilosis; capitis vertice subnigra, superficie antica dilute brunnea, margine antico modice emarginato; scutorum lateribus canaliculatis; mucrone modice magno, recto, robusto; segmentis 56, haud pilosis.

The color of this species is a sort of bluish gray, more or less involved in the brown rings. The antennæ are slender, and not at all clavate. The sides are chased with moderately close channels, which on the anterior scuta are strongly pronounced, but on the posterior are somewhat obsolete. The last scutum is prolonged into a somewhat blunt mucro, at least the latter is quite obtuse in the only specimen which I have seen. The male genital appendages are composed, as in the allied species, of two parts. The chief of these gives origin on the outer part on each side to a process, which is bifurcated almost to its base; the arms which thus originate are separated by a narrow fissure, one of them is thin, broad, and distally narrowed to a point; it is so placed as to present its broad aspect somewhat obliquely towards the flank of the animal. The other is shorter, clavate, distally coarsely profusely pilose, and set as it were at an angle to the first, so as to face obliquely backwards. The inner portion of the male appendages consists on each side of two slender, subcylindrical, smooth processes, which are united at their bases: shortest of them is nearly straight, the longer somewhat bent. The length of my specimen is nearly two inches.

I. DIVERSIFRONS.

I. saturate brunneus, linea nigra mediana et seriebus lateralibus græ ornatus; capitis vertice subnigra, superficie antica cine
distincte emarginato; mucrone modice magno, recto; segmen

The antennæ of this species are filiform and pubescent. The male genital appendages are composed on each side of two parts, the outer of which is broad, thin, and very irregular, ending in two processes, of which the outer is short, very strongly expanded distally and pilose, and often of a black color; the inner is longer and more irregular, narrowing from the base, distally it is bent nearly at right angles to itself, ending in cylindrical points. The inner of the two parts is composed of a single irregular, thin process, which has at first somewhat of the swan-neck curve, and near its end is bent sharply at right angles to itself; it gives origin to two sharp spines, one arising from the angle and the other from the shaft, so as to be, as it were, shielded by the bent portion. The female appendages are similar to those of *I. impressus*, differing, however, in the shape of the lower plates on each side, which give more the appearance of a volute shell than of a bivalve. The total length of the head and body is about two inches.

This is a species of which I received a single specimen in a large collection from South Illinois, and mentioned under *I. impressus* in my monograph. It appears to be rare in the Western States, but very plenty in Texas.

On two New Minerals from Chester Co., Penn.

BY ISAAC LEA.

On a visit last summer to the well known *Corundum* locality near Unionville, Chester Co., my attention was attracted to an adhering fibrous mass, on the side of a large piece of *Corundum* on the farm of Mr. John Lesley, Jr. This was evidently different from any mineral accompanying *Corundum* which I had ever seen; and the application of my chisel showed at once that it had no outward characteristic of that exceedingly hard mineral. On the contrary, the edge of the instrument easily pengtrated it, but at the same time it was tough and adhered so closely to the side of the mass of *Corundum* that it was with great difficulty I got quite a large piece off without breaking it up. Subsequently I took my friend Mr. Jefferis to the spot, and we obtained the remaining portion. On the careful examination of other masses of *Corundum* in possession of Mr. Lesley we could find no more of it. We found, however, pieces of a soft mineral which had a lamellar structure, and which I think will prove to be the same substance when they shall both be analysed. Believing that these are varieties of the same mineral, and that it has heretofore not been observed, I propose to call it *Lesleyite*, after the proprietor of the farm where it was found.

On some of the masses of *Corundum* we found very fine large lamellar crystals of *Emerylite*, some of the cleavage laminæ of which were one to two inches long and more than an inch broad. Some of these crystals exhibited well defined hexagonal prismatic sides. I believe no such fine specimens of *Emerylite* have been found elsewhere. In a few cases there were beautifully decremented crystals. In some of the cleavage plates may be observed irregular red spots, which under the microscope are transparent and of a bright color, but they present no regular crystalline form and are, no doubt, composed of one of the oxides of iron. When thin laminæ were subjected to the polaroscope the red color was unusually brilliant.

Connected with these crystals of *Emerylite* and passing into and through them, are dark green hexagonal, translucent *Tourmalines*, in prisms often an inch long, some of them being one-tenth of an inch thick. There is also much black *Tourmaline* connected with the *Corundum*.

The most important and rarest mineral of this locality is, however, *Diaspore* (Dihidrate of Alumina.) This I found in connexion with the large cleavage plates of *Emerylite* which surrounded the crystals of *Diaspore*, imbedding them in the mass. Some of the *Diaspore* was in lamellated masses of two to three inches and often of adamantine brilliancy. Some of the crystals of *Diaspore* are of a pure opaque white, while others are of a fawn color inclining to topaz

color. Others again are greenish and splendent. The prisms are hexagonal with four terminal planes, somewhat like the figure in Dana's Mineralogy. The largest I found is imperfect and measures in length an inch, and in breadth three-fourths of an inch. The finest and most perfect one is eleven-twentieths of an inch long and five-twentieths thick, being well terminated at both ends with four planes. Two small ones, about three-tenths of an inch long, are terminated also at both ends with four planes. These as well as some other crystals present very closely the color and appearance of crystals of *Topaz*. One of the crystals of *Diaspore* had a crystal of transparent green *Tourmaline* passing through the middle of the prism and the whole was enveloped by lamellar crystals of pearly *Emerylite*, showing that the *Tourmaline* was first crystallized, then the *Diaspore* and lastly the *Emerylite*. Mr. Jefferis also obtained some fine specimens.

Another species of mineral, which I believe heretofore unnoticed, belongs to the *Mica* Family. It is found only imbedded in the masses of *Lesleyite*. It has a gray metallic color resembling *Zinc*. It is translucent only in thin cleavage laminæ. I propose to call this *Pattersonite*, after Mr. Johnson Patterson, the owner of the adjoining farm, and where the large masses of *Corundum* were first found, one of which weighed four thousand pounds. Mr. Patterson has always most liberally promoted the objects of Mineralogists who have visited him in search of minerals, and it is due to Mr. Lesley to say the same of him.

Lesleyite. Fibrous or lamellar, sometimes inclining to massive. Color whitish passing into reddish. Hardness about three. Streak white. Before the blowpipe parts with its water and becomes opaque white. Does not fuse with borax. Does not dissolve in muriatic acid. Under the microscope it presents no observable characteristics. Its gravity is greater than that of quartz. There is a disposition in the crystalline fibrous structure to diverge from a central point to be stellate, and in one crystal before me the radiating fibres are nearly four inches long.

Pattersonite. Basal cleavage imperfect, rarely if ever presenting an hexagonal prism, but disposed to present triangular plates, which joining make a subtetrahedral mass. The laminæ are not flexible and but slightly translucent. The color is metallic, bluish gray, resembling *Zinc*. The streak is grayish. Before the blowpipe parts with its water, but does not exfoliate like *Jefferisite*, nor does it intumesce like *Cryophyllite* and *Lepidomelane*, both of which fuse easily. With borax melts into a black bead. Does not dissolve in muriatic acid. Hardness about two. Under the microscope, with a power of one hundred diameters, many imperfect black plates may be observed, some of which are hexagonal, and they are probably one of the oxides of iron, *Göthite?*

This mineral may easily be distinguished from *Muscovite* by its crystalline form, by its color and by its opacity. From *Clinochlore* by its lighter color, its form of crystals, its transparency and its want of elasticity of laminæ. From *Cryophyllite* by its lighter color and its want of easy fusibility. From *Lepidomelane* by its lighter color, its want of easy fusibility, its crystalline form, &c.

A third study of the ICTERIDÆ.

BY JOHN CASSIN.

3. Sub-family ICTERINÆ.

Having for examination one of the most extensive collections of the birds of this group ever got together, and which includes a large number of specimens in young and immature plumage, as well as adults, with the sexes carefully marked, I have given short descriptions of all the species, and the various plumages of females and young, so far as they can be clearly determined. Of such species as I have not specimens, but of which I have no reason to doubt the validity, I have copied the original descriptions.

This large and comprehensive series is composed essentially of the collection of the Philadelphia Academy, the fine and in fact extraordinary collection of the Smithsonian Institution, placed at my disposal with the usual generosity and true scientific spirit of that great Institution by Professor Joseph Henry, its accomplished Secretary, and the fine collection of my friend, that distinguished ornithologist, Mr. George N. Lawrence, of New York. The collection of the Philadelphia Academy contains nearly all the species mentioned in this memoir, mainly derived from the Massena collection, but the labels indicating locality are not always sufficiently explicit,—in which respect, however, those of the Smithsonian Institution and of Mr. Lawrence are generally entirely authentic and satisfactory.

I. Genus ICTERUS, Brisson.

Genus Icterus, Briss. Orn., ii. p. 85 (1760),

1. *Icterus.*

1. ICTERUS VULGARIS, Daudin.

Icterus vulgaris, Daud. Traite d'Orn. ii. p. 340 (1800).
Oriolus Icterus, Linn., Syst. Nat. i. p. 161 (1766).
Coracias Xanthornus, Scop., Ann. Hist. Nat. i. p 39 (1768); not *C. Xanthornus*, Linn., Syst. Nat. i. p. 108 (1758).
Aud. B. of Am., oct. ed., vii. pl. 499. Buff. Pl. Enl. 532. Catesby Car. App. pl. 5.

Large; plumage of the throat and neck in front elongated, linear and pointed; bill nearly straight or slightly curved. A naked space behind the eye. Wing rather long, third and fourth quills longest; tail rather long, feet robust. Adult ♂. Head black; back, wings and tail black; shoulders yellow, greater coverts white, and edges of shorter quills white, forming a longitudinal band of white on the wing. Neck behind, rump, and entire under parts usually rich orange yellow, frequently paler yellow, and inclining to lemon or sulphur yellow. Bill dark bluish-black, base of under mandible light blue, frequently nearly white; legs bluish-brown. Total length about 9½ to 10 inches; wing 4½ to 5, tail 4 to 4¼ inches. Younger. Like the adult, but with the black plumage tinged with brown. Quills dark brown, under parts dull gamboge-yellow. Total length about 9 inches.

Hab.—Northern South America, Venezuela, Guiana, Rio Negro, northern Brasil, Jamaica? southern United States? Spec. in Mus. Acad., Philada., and Mus. Smiths., Washington.

Easily recognized by its lengthened beard-like feathers on the throat and neck, its large size, and wide stripe of white through the wing longitudinally from the yellow of the shoulder to the end of the secondary quills. The next species has, however, all these characters, and is probably not distinct. I have only seen this species from Northern South America, though one specimen in the Smiths. Mus. is undoubtedly from Jamaica; but this bird is so common in cages that almost any locality is possible!

2. ICTERUS LONGIROSTRIS, (Vieillot).

Agelaius longirostris, Vieill. Nouv. Dict. xxxiv. p. 547 (1819).
Icterus longirostris, (Vieill.) Bonap. Consp. Av. i. p. 435.

Hab.—Northern South America; "Carthagena, New Grenada" (Verreaux). Spec. in Mus. Acad. Philada., and Mus. Smiths. Washington.

This species, if such it is, may be distinguished from the preceding by its more slender and rather longer bill, and the specimens that I have seen are a pale lemon-yellow, instead of the usual orange-yellow of *I. vulgaris;* but it has the same description of lengthened and linear feathers on the neck in front, and the longitudinal band of white on the wing. In this bird the black of the head perhaps extends downwards on the neck further than in the preceding, but the general distribution of colors is very nearly the same. The character indicated by Bonaparte as above, "*sed cervice nigra*," I fail to recognize. It is a species of but very imperfect respectability.

One specimen in the Smithsonian Mus., labelled as this bird in the handwriting of that excellent ornithologist, Jules Verreaux, is from Carthagena, New Grenada; others, in the Academy Mus., are without labels indicating

locality. This bird and the preceding are not uncommon in the cities of the United States on the Atlantic seaboard, as cage-birds.

3. ICTERUS AURANTIUS (Hahn.)

Xanthornus aurantius, Hahn, Voeg. pt. vi. p. 1 (1820).
"Xanthornus aurantius, Wagler," Hahn, as above.
Oriolus Jamacaii, Gm. Syst. Nat. i. p. 391 (1788).
Jamacaii Brasiliensibus, Marcg. et Piso, Hist. Nat. Brasil, p. 198 (1648).
Hahn, Voeg. vi. pl. 1. Prevost, Ois. Exot. pl. 70.

Easily distinguished from the preceding by the feathers of the throat and neck being somewhat lengthened only, but of the usual form (not linear nor pointed, as in the preceding). Greater wing coverts black, a large triangular spot of white on the wing (not a long wide stripe, as in the preceding). Naked space behind the eye, small.

Large, bill nearly straight, pointed; wing rather long, third, fourth and fifth quills longest; tail long; feet robust. Head, back, wings and tail black, shoulders orange-yellow, wing with a large triangular spot of white. Neck behind, rump, and entire under parts rich orange-yellow. Bill bluish-black, lighter at base of under mandible; legs dark brown. Total length about 10 inches; wing 4½, tail 4½ to 4¾ inches. Adult male. Female rather smaller, but similar in colors.

Hab.—Brazil; Bahia; Ceará. Spec. in Mus. Acad. Philada., and Mus. Smiths. Washington.

This species can readily be distinguished from *I. vulgaris*, with which it has been frequently confounded, by the absence of the long beard-like feathers of the throat which characterize the former bird, and other strong characters. The fine orange color prevailing in this group of birds attains a maximum in this beautiful species, and seems especially rich and inclining to brilliant reddish in specimens from Northern Brazil. This bird and *I. gularis* are the largest of this genus, both being rather larger than *I. vulgaris*.

The proper name, by right of priority, for this species, is undoubtedly *Jamacaii* of Gmelin, which seems to have been adopted from Marcgrave and Piso, as above. This name bears no relation nor intimation whatever to the island of Jamaica, but is apparently an attempt to Latinize the native name "*Jamac.*" It is, however, too readily to be misunderstood, and on that account I do not regard its adoption as expedient, especially as I have *I. vulgaris* undoubtedly from Jamaica. Numerous specimens in the Acad. Mus. and in Smiths. Mus., from Brazil. The finest plumage, and apparently most perfectly adult, are from Ceará, Northern Brazil.

2. *Euopsar.*

4. ICTERUS CROCONOTUS (Wagler.)

Psarocolius croconotus, Wagl. Isis, 1829, p. 757.
Dumont, Dict. Sci. Nat. Atlas Ois. pl. 50, fig. 1. Guerin. Icon. Reg. An. Ois. pl. 20, fig. 1.

Large, with the front, face and throat only black (not the entire head, as in the preceding three species). Bill nearly straight, and rather short, a naked space behind the eye; wing moderate; tail rather long; legs stout. Adult ♂. Head above, and entire body above and below rich orange-yellow, tinged with red, especially on the top of the head and neck behind. Front and wide space on the throat, and sides of the head enclosing the eyes, shining black. Wings and tail black, shoulders orange-yellow; a triangular spot on the wing, white, scapulars yellow, tipped with black, under wing coverts fine chrome yellow. In some specimens there are a few black feathers on the back. Bill bluish-brown, lighter at base of under mandible. Total length about 9½ inches; wing 4¼, tail 4¼ inches. Female. Like the male, but smaller, and yellow plumage frequently tinged with dull gamboge yellow. Total length about 8½ inches. In some specimens of this species the feathers of the throat and neck in front are somewhat elongated and linear (as in *I. vulgaris*).

Hab.—Brazil; Bolivia; "head waters of the river Huallaga, Peru." Spec. in Mus. Acad. Philada., and Mus. Smiths. Inst. Washington.

This splendid species may be regarded as rivalling the preceding (*I. aurantius*), and is another beautiful bird. Numerous specimens in the Smiths. Mus. are from the Rio Parana, Brazil, and other localities in that country, from Bolivia, and in a fine collection made by Mr. Walter S. Church on the river Huallaga, Peru, as above. The Acad. specimens are from Brazil; specimens from Capt. Page's expedition to the Rio Parana, and labelled "Brazil," are the smallest. The figures cited above are sufficiently good for the easy recognition of this fine species, which has often been confounded with the preceding.

5. ICTERUS PECTORALIS (Wagler).

Psarocolius pectoralis, Wagl. Isis, 1829, p. 755.
Icterus guttulatus, Lafres. Mag. Zool. 1844, p. 1.
Mag. Zool. 1844, pl. 52. Des Murs, Icon. Orn. pl. 10.

Adult. About the size of the preceding, *I. croconotus*. Breast *spotted* with black, shorter quills widely edged externally with white, back black. Head above, sides of neck, rump, and entire under parts, *orange-yellow*, deepest and reddish-orange on the head. Throat, lores, back, wings and tail black. Base of tail pale yellow; shafts of tail feathers (at base) white; bill bluish, lighter at base of lower mandible; legs light colored (in skins). Total length about 8½ to 9 inches; wing 4 to 4¼, tail 4 to 4¼ inches.

Younger. Tail olive-green, quills dull brown; black plumage of the back edged with greenish.

Hab.—Central America; Nicaragua; Costa Rica. Spec. in Mus. Acad. Philada., and Smiths. Mus. Washington.

Easily recognized by its spotted breast, and well represented in the plates cited above. Specimens in the Acad. Mus., Philada., from San Juan de Nicaragua and Coban, Vera Paz, and in the Smiths. Mus., Washington, from Nicaragua and Costa Rica. A very fine, large species, apparently abundant in those countries. The edging of the shorter quills forms a long triangular spot of white in the terminal half of the wing, and there is a smaller spot of white near the base of the first primaries. Specimens from Nicaragua are the largest.

6. ICTERUS PUSTULATUS (Wagler).

Psarocolius pustulatus, Wagl. Isis, 1829, p. 757.
Pendulinus Californicus, Less. Rev. Zool. 1844, p. 436. Oeuv. Buff. Supp. vii. p. 333.

Adult ♂. Smaller. Back with longitudinal ovate spots of black, detached, isolated, and frequently not numerous in the adult, but larger, confluent, and inclining to form longitudinal stripes of black on the back in the younger or adolescent male. Head and body above and below orange-yellow, frequently deep reddish-orange on the head and breast. Throat, lores, wings and tail black. Shoulders yellow, medial coverts of the wing white, forming a wide transverse or diagonal band on the wing; all the quills, except the first, widely edged with white; tail black, tipped with white and pale yellow at base, shafts white (at base of tail). Bill bluish, paler at base of lower mandible; legs light bluish-grey (in skins). Total length about 7½ to 8 inches; wing 3¼ to 4, tail 3½ to 3¾ inches.

♀. Entire upper parts yellowish olive, tinged with ashy on the back, and with ovate brownish-black spots (on the back). Under parts greenish-yellow, throat black, wings ashy brown, all the coverts and quills edged with white; tail olive green. Total length about 7 inches. Young ♂. Like the female, but with the brilliant reddish-orange appearing on the head in front and sides of the neck; white edgings of the quills and coverts more conspicuous.

Hab.—Mexico (Mazatlan). Spec. in Mus. Acad. Philada., and Mus. Smiths. Washington.

Numerous specimens in the Acad. Mus., Philada., labelled as from Mexico, and in the Smiths. Mus.; also from Mexico, the latter being mainly in the large and valuable collections of Col. A. J. Grayson and Capt. John Xantus, from Mazatlan and other localities in Western Mexico. In the adolescent and nearly mature plumage this bird is *Pendulinus Californicus*, Lesson, as above.

This is a very handsome small species, not difficult to recognize by the ovate longitudinal spots of the back (unde nomen, *pustulatus*), and the deep reddish-orange (or orange-red) of the head and breast. It appears to be an abundant species of Western Mexico. This species does not appear to have been figured by any author.

7. ICTERUS GRAYSONII, nobis.

Large; resembling the preceding (*I. pustulatus*), but much larger, and with very few or no spots on the back. About the size of *I. gularis*, but not resembling that species. Bill nearly straight, gradually tapering, and not unusually thick at base; wing moderate, fourth quill longest; tertiaries rather long; tail moderate or rather long; legs and feet moderate.

Adult ♂. Entire plumage of the head and body orange-yellow, rather lighter and duller on the back, deeper, and inclining to reddish-orange on the head in front, sides of the neck and breast. Back with a few small, partially concealed spots of black. Lores, throat, wings and tail black. Shoulders yellow, greater coverts, and all the quills except the first, widely edged with white on their *outer* edges. Scapulars yellow, edged externally with black. Greater wing coverts and primaries edged also with white on their *inner* edges. Tail black, tipped with ashy white, and with its basal one-fourth yellow, where also the shafts of the feathers are white. Bill and legs bluish, the latter darker. Total length about 9¼ inches; wing 4¼, tail 3¾ inches.

tipped with white, primaries narrowly edged, tertiaries rather widely edged with white, in some specimens the tail is very narrowly tipped with grayish-white. Bill bluish or horn-color, lighter at the base of the under mandible; legs light brown. A small white triangular spot at base of primaries. Total length about 9¾ inches; wing 4¼, tail 4 inches.

Adult ♀. Generally like the male, but with the back and wing coverts yellowish olive-green; tail brownish-olive; throat black. Wings (and shoulders) grayish-brown, coverts and quills edged with grayish-white. Total length 9¼ inches.

Young ♂. Like the female, but with the black beginning to appear on the back and scapulars; tail brownish-black.

Hab.—Mexico; Nicaragua. Spec. in Mus. Acad. Philada., and Mus. Smiths. Inst. Washington.

Easily recognized by its large size, and thick, straight bill. This fine species is one of the largest and most robust of the group. Numerous specimens in the Smiths. Mus. from Mexico.—"Mirador, near Vera Cruz," "Salvador," "Barcio," "San Jeronimo, Vera Paz," and other localities, and in the Acad. Mus. from the city of Mexico, from San Juan de Nicaragua, and others labelled only "Mexico."

Specimens of this bird from San Juan de Nicaragua, undoubtedly authentic in locality, are quite as large as others from Mexico. This species is certainly *Icterus mentalis*, Less., as above, upon the examination of the description of which it will be found that a large specimen is required, instead of smaller, as stated by eminent ornithologists. Well represented in Des Murs' plate, above cited; Lesson's plates are not entirely correct.

10. Icterus Xanthornus (Gmelin).

Oriolus Xanthornus, Gm. Syst. Nat. i. p. 391 (1788).
Xanthornus linnæi, Bonap. Consp. Av. i. p. 434 (1850).
Xanthornus nigrogularis, Hahn, Voeg. pt. v. p. 1 (1820)?
Briss. Orn. ii. pl. 11. fig. 2. Buff. Pl. Enl. 5. fig. 1. Shaw, Nat. Misc. vii pl. 243. Prevost, Ois. Exot. pl. 70. Hahn, Voeg. pt. v. pl. 1?

Smaller; entirely yellow, greenish on the back; throat, wings and tail black. Bill short, straight, thick at base; wing rather short, third and fourth quills longest; tail moderate; legs rather strong. Total length about 7 to 7¼ inches; wing 3½, tail 3¾ to 3¼ inches.

Adult ♂. Entire head and body rather dark lemon-yellow, inclining to orange on the sides of the neck and breast, usually strongly tinged with greenish on the back, but sometimes slightly only. Lores and throat with a narrow connecting line at the base of the under mandible, black. Shoulders yellow, wings black, greater coverts tipped with white, primaries very narrowly edged, tertiaries more widely edged with white; a triangular spot of white at base of primaries. Tail black, pale yellow at base, and usually very slightly tipped with grayish-white; bill and feet bluish. Scapulars with large, partially concealed spots of brownish-black.

Adult ♀. Like the male, but with the entire upper parts strongly tinged with olive-green; yellow of the under parts duller and less inclined to orange on the breast. Wings dark brown; tail olive-green. About the size of the male. Young ♂. Like the female, but with the tail black.

Hab.—South America; Venezuela; Cayenne; Trinidad; Northern Brasil. Spec. in Mus. Acad. Philada., and Mus. Smiths. Inst. Washington.

An abundant and well known species, of which specimens are in all collections in this country. Varies in the shade of yellow, but easily recognized. The plates of Buffon and Prevost, as above given, are good representations of this species.

11. Icterus auratus, Bonaparte.

"Icterus auratus, Du Bus, Mus. Brux." Bonap. Consp. Av. i. p. 435 (1850).
"Icterus mexicanus, Bonap. MSS." J. Verreaux's label.
"Xanthornus mexicanus, Brisson," Bonap. Compt. Rend. 1853, p. 835.
"Xanthornus nigrogularis, Hahn," Bonap. as above.

Larger than the preceding (*I. Xanthornus*), but resembling it; colors nearly the same, but the yellow clearer, and with very little tinge of olive on the back in the adult; black of the throat longer and much wider. Bill short, thick; wing moderate, third and fourth quills longest; tail moderate.

Adult ♂. Head and body above and below rather dark lemon-yellow, inclining to orange on the sides of the neck and breast. Lores and throat, and narrow connecting line at base of lower mandible, black. Wing black, shoulders yellow, greater coverts tipped with white, primaries very narrowly edged, tertiaries more widely edged with white. Tail black, pale yellow at base; bill and legs bluish. Total length about 8½ inches; wing 4, tail 3¾ inches.

Hab.—Mexico. Spec. in Mus. Smiths. Inst. Washington.

America. Numerous specimens in the Mus. Smiths. Inst. are from Greytown, Nicaragua, and various localities in Costa Rica. Specimens in Acad. Mus. are from Bogota, New Grenada, and from Venezuela, and are undoubtedly correct in locality.

This fine species is dedicated to Osbert Salvin, Esq., of London, a most accomplished ornithologist, and most liberal patron of the natural sciences.

14. Icterus Grace-Annæ, nobis.

In a large and highly interesting collection made by the Hon. John Randolph Clay, while United States Minister to Peru, and now in the possession of the Philadelphia Academy, there is one specimen of a small species of this group which I cannot identify from any figure or description. It is a small thick-billed species, about the size of *I. Xanthornus*, but with colors much resembling those of *I. mesomelas;* easily distinguished, though, from the latter, by its smaller size, and by having the tail entirely black and a very conspicuous, longitudinal spot of white in the middle third of its wing. It is very probably the bird alluded to by the Prince Bonaparte under the head of *Xanthornus mesomelas*, Consp. Av. i. p. 434, "var. *ex Peru, Minor*. An species?" It is a quite distinct and strongly marked species.

Adult. About the size of *I. Xanthornus*, but does not resemble it in colors; smaller than *I. mesomelas*, but similar to that species in general colors only, and easily distinguished in having a conspicuous longitudinal spot of white in the middle of the wing, and the tail entirely black. Head and neck above, rump and entire under parts (except the throat) lemon yellow; throat, lores, wings, tail, and a wide transverse band across the back, black. Shoulders and under wing coverts yellow, the greater wing coverts white, which color is partially concealed by the yellow of the shoulders. Outer edges of the shorter quills, in their middle third, white, forming a longitudinal spot about the middle of the wing. In the present specimen the outer feathers of the tail are edged and narrowly tipped with ashy, nearly white at the ends, and the next two feathers of the tail are also narrowly tipped with ashy-white. Bill and feet bluish-black, paler at the base of the under mandible.

Total length 7½ inches; wing 3¼, tail 3⅜ inches.

Hab.—Western South America; Peru? Spec. in Mus. Acad. Philada.

The fine collection of Mr. Clay, though mainly composed of birds of Peru, contained also some species of Ecuador and Bolivia, or hitherto only known as from those countries. The locality of the present species cannot therefore be given positively, but it is undoubtedly from western South America.

This handsome little bird I have named in honor of my highly esteemed friend, Miss Grace Anna Lewis, of this city: accomplished as a teacher of Natural History, conscientious in all social duties and relations, faithful in her friendships.

15. Icterus Giraudii, Cassin.

Icterus Giraudii, Cass. Proc. Acad. Philada. 1847, p. 333.
Xanthornus chrysater, Less. Oeuv. Buff. Supp. vii. p. 332 (1847)?
Icterus melanopterus, Hartl. Rev. Zool. 1849, p. 275.
Jour. Acad. Philada. i. pl. 17 (quarto).

Resembling the three last preceding in colors, but with the back clear yellow, uniform with the other upper parts (not black, as in *I. mesomelas*, *I. Salvini*, and *I. Grace-Annæ*). Bill nearly straight, conic, thick at base, and gradually pointed; wing rather long, third and fourth quills longest; tail moderate, graduated; feet moderate.

Adult ♂. Head and entire body above and below rich chrome or sulphur-yellow, with a tinge of orange on the under parts; shoulders and inferior coverts of the wing yellow. Front, lores, and wide space on the throat and neck, enclosing the eyes, black; wings and tail black. Scapulars yellow, tipped with black (wings clear lustrous black, with paler edgings only towards the ends of the primaries; tail clear black, back yellow, not black, as in the preceding three species). Bill dark bluish, or horn-color; legs bluish-gray. Total length about 8½ inches; wing 4, tail 4¼ inches.

Younger. Entire upper parts tinged with dull greenish, under parts with dull orange or gamboge; wings brownish-black, quills narrowly edged with dull yellowish-green; tail dark brown; shoulders black or dark brown.

Young. Entire plumage dull greenish-yellow, black appearing on the throat, wings and tail dark brown, outer feathers of the tail with their shafts white. Total length about 7½ inches.

Hab.—Southern Central America and northern South America; Mexico? Spec. in Mus. Acad. Philada., and Mus. Smiths. Inst. Washington.

This very handsome species is another of those in which the plumage is

5. *Cassiculoidea.*

18. Icterus Parisorum, Bonaparte.

Icterus Parisorum, Bonap. Proc. Zool. Soc. London, 1837, p. 110.
Icterus melanochrysura, Less. Rev. Zool. 1839, p. 105.
Icterus Scottii, Couch, Proc. Acad. Philada. 1854, p. 66.
Icterus melanocephalus, Hahn, Voeg. Am. pt. vi. p. 4 (1820)?
Hahn, Voeg. pt. vi. pl. 3? Baird, B. of N. A. pl. 61, fig. 1. Rept. U. S. and Mex. Bound. Surv. Birds, pl. 19, fig. 1.

Anterior half black, or head and neck, back and breast, black. Abdomen and rump yellow, the latter generally tinged with greenish. Wings black, the greater coverts widely tipped with white, shorter quills widely edged with white. Middle feathers of the tail black, with their bases yellow; other feathers of the tail with their basal two-thirds yellow, terminal one-third black. Bill dark horn-color, base of under mandible pale blue; legs bluish-brown. Bill straight, rather slender, pointed, culmen distinctly ridged; legs rather strong; wing long, third quill longest; tail moderate. Adult male. Total length about 7 to 8 inches; wing 4 to 4¼, tail 3½ to 3¾ inches.

Younger ♂. Entire head and back dark brown; rump greenish-yellow, under parts of body dull pale yellow; tail olive-green; outer feathers greenish-yellow at base; wings dull brown, coverts tipped with white. Total length 7 inches.

Hab.—Mexico; Lower California (Capt. Xantus); Texas; New Mexico. Spec. in Mus. Acad. Philada., and Mus. Smiths. Washington.

This is another strange and peculiar form in the generic group *Icterus*, and belongs almost as properly to *Cassicus*. The colors, too, are quite peculiar, and approximate to the same group. It may be termed an analogue of *Cassiculus*, in the genus *Cassicus*, if not more nearly related, but I am by no means confident that this bird does not represent a peculiar generic division. Numerous specimens in Smiths. Mus. from Northern Mexico and Lower California. This is the bird, I suspect, attempted to be represented in Hahn's plate, above cited, but without success. It is, however, correctly and handsomely given in Prof. Baird's plates, as cited.

II. Genus PENDULINUS, Vieillot.

Genus Pendulinus, Vieill. Analyse, p. 33 (1816).

This group is composed of birds characterized by having more slender, lengthened, and weaker forms than in *Icterus*, with more slender, curved, and gradually tapering bills, and long tails, either rounded at the ends or graduated. It is, in my opinion, a distinct and strongly marked generic group, of which the species here given as *P. bonana* is perhaps to be regarded as typical. The type of the genus, according to Vieillot, is the North American *P. spurius*, but in this respect he is probably in error, that species being, very probably, one of the most aberrant. Fifteen species of this genus are in the Museum of the Philadelphia Academy and the Museum of the Smithsonian Institution, Washington. Three others given in the succeeding pages (*P. rufigaster*, *P. rufaxillus*, and *P. chilensis*) are not contained in either of the two collections mentioned. In this group, as in the preceding, I have given short descriptions of all the species of which I have any knowledge, and have copied the original descriptions of the three species to me unknown, above mentioned.

1. *Bananivorus.*

1. Pendulinus Bonana (Linnæus).

Oriolus Bonana, Linn. Syst. Nat. i. p. 162 (1766).
Pendulinus banana, Vieill. Nouv. Dict. v. p. 316 (1816).
Buff. Pl. Enl. 535, fig. 1.

Head, neck and breast dark chestnut, shoulders, rump and abdomen a paler shade of chestnut, lightest on the rump. Back, wings and tail black; under wing coverts pale chestnut; upper and under tail coverts frequently tipped with black. Bill dark horn-color, paler at base of under mandible; legs brown. Bill curved, slender; wing rather long, third quill longest; tail rather long, graduated. Adult ♂. Total length about 7½ inches; wing 3½, tail 3⅝ inches. Female. Like the male, but smaller. Total length about 7 inches.

Hab.—West Indies; Martinique (Smiths. Mus.) Spec. in Mus. Acad. Philada., and Mus. Smiths. Washington.

Although having abundance of specimens before me in the Acad. Mus. and Smiths. Mus., I am not able to state the islands of the West Indies inhabited by this species, nor have I seen any other than the adult plumage. One specimen only in the Smiths. Mus. is undoubtedly from the island of Martinique, but all others now before me are either labelled "West Indies" or "Antilles." This is a quite peculiar, and, in adult plumage, an easily recognized species, but is probably allied to the immediately succeeding (*P. rufigaster*).

2. PENDULINUS RUFIGASTER, Vieillot.

Pendulinus rufigaster, Vieill. Nouv. Dict. v. p. 321 (1816).

"Bananivorus rufigaster, Bp. ex Vieill.," Bonap. Comp. Rend. 1853, p. 834.

"Cette espèce, que je crois nouvelle, a le ventre et les parties posterieures d'un roux ardent; le rest du plumage noir, ainsi que le bec et les pieds; taille du *carouge* esclave (*P. dominicensis*). Elle se trouve dans l'Amerique méridionale." Vieillot, as above.

"Nigro; capite, collo, pectoreque castaneis; uropygio, corpore subtus, tibiis, tectricibusque alarum minoribus et inferioribus, fulvis. Le *Troupiale enfumé* du Musée de Paris, rapporte de la Guadaloupe par M. Moreau de Jonnes, nommé par Vieillot, *Pendulinus rufigaster* et réuni à tort au *spurius*." Bonap. Compt. Rend., as above.

Hab.—Gaudeloupe. Spec. in Paris Museum.

These are the original descriptions of a bird given as distinct from *P. bonana* by Bonaparte, as above cited, but which I have not seen. It seems to be nearly related to that species, but may be an inhabitant of different islands, and, like others in this memoir, persistently presenting some clearly peculiar characters. On the faith of the description by Bonaparte, I give it as probably a species of respectability, and his indication of the locality is important. It is given doubtfully by that great naturalist in Consp. Av. (i. p. 432) as synonymous with *P. spurius* of North America, which I suppose is the *tort* to which he alludes.

3. PENDULINUS RUFAXILLUS, Bonaparte.

Pendulinus rufaxillus, Bonap. Consp. Av. i. p. 432 (1850).

"Ex Mexico. Nigerrimus; humeris cinnamomeo-castaneis; tectricibus alarum minoribus citrino-castaneis; cauda elongata; rostro elongato, acutissimo." Bonap., as above.

This species I have not seen. It seems to resemble in colors of plumage, at least, *Agelaius pyrrhopterus*, Vieill. (which is *Hyphantes pyrrhopterus* of this memoir), but that species was apparently known to the Prince Bonaparte, as he gave it a name (*Pendulinus periporphyrus*, Bonap. Consp. Av. i. p. 432.)

2. *Poliopsar.*

4. PENDULINUS WAGLERI (Sclater).

Icterus Wagleri, Sclat. Proc. Zool. Soc. London, 1857, p. 7.

Psarocolius flavigaster, Wagl. Isis, 1829, p. 756.

Pendulinus dominicensis, Bonap. Consp. Av. i. p. 432 (nec Linn.)

Baird, B. of N. A. pl. 61, fig. 2. Rept. U. S. and Mex. Bound. Surv., Birds, pl. 19, fig. 2.

Larger; head, neck and back black; shoulders, rump and abdomen orange-yellow; wings and tail black, upper and under tail coverts black. The black on the breast separated from the yellow of under parts of the body by a narrow band of chestnut, frequently obscure, but generally strongly marked. Under wing coverts yellow. Bill long, curved, bluish-black, lighter at base of under mandible; legs dark brown; wing rather long, third and fourth quills longest; tail long; legs rather short. Adult ♂. Total length about 9 inches; wing 4¼, tail 4⅛ inches.

Young. Entire upper parts yellowish-green, inclining to clearer yellow on the head, and green on the back; throat black; sides of neck and under parts of body dull yellow; wings dark brown, coverts edged with dull white; shoulders greenish-yellow; tail with the middle feathers brownish-black, outer feathers yellowish-green. Total length about 8 inches.

Younger. Entire upper parts of head and body dull olive-green; under parts dull-pale greenish-yellow.

Hab.—Mexico; Guatemala; State of Coahuila, northern Mexico (Gen. Couch); Mazatlan (Col. Grayson); San Geronimo, Guatemala (Mr. O. Salvin). Spec. in Mus. Acad. Philada., and Mus. Smiths. Washington.

The under tail coverts being *black*, is a character to be remembered in com-

paring this fine species with the next succeeding in this memoir (*P. prosthemelas*), as the most immediately available character. It resembles and is nearly allied to that species. Numerous specimens in Acad. Mus. and Smiths. Mus. from Mexico and Guatemala, in both of which countries this handsome bird seems to be abundant.

5. PENDULINUS PROSTHEMELAS (Strickland).

Icterus prosthemelas, Strickl. Jard. Contr. Orn. 1850, p. 120.
Pendulinus Lessoni, Bonap. Consp. Av. i. p. 432 (1850).
Jard. Contr. Orn. 1850, pl. 62.

Resembling the preceding (*I. Wagleri*), but smaller, and with the under tail coverts yellow, uniform with the abdomen. Head, neck and back black; shoulders, rump, abdomen and under tail coverts yellow; a transverse band of chestnut separating the black from the yellow on the breast, frequently strongly marked, but often obscure or imperfect. Wings and tail clear black, longer upper tail coverts black, under wing coverts yellow. Bill shorter than in the preceding, curved, rather thick at base; wing moderate, third quill longest; tail long. Bill bluish-black, pale blue at base of under mandible; legs brownish-black. (No white marks nor spots in wings nor tail.) Adult ♂. Total length about 8 to 8½ inches; wing 3½, tail 3½ to 3¾ inches.

Young. Singularly resembling in colors *I. melanocephalus* and *Audubonii*. Head and neck in front black; entire upper parts of body greenish-yellow, shoulders and abdomen yellow. Wings and tail black. Total length 7¼ to 8 inches. Adolescent, with the black of the adult beginning to appear on the back and scapulars, and presenting a mottled yellowish-green and black, in which plumage this bird is *P. Lessoni*, Bonap., as above.

Hab.—Guatemala; Costa Rica; southern Mexico. Spec. in Mus. Acad. Philada., and Mus. Smiths. Washington.

This bird resembles the preceding (*P. Wagleri*), but is smaller, and has the under tail coverts yellow instead of black. It is undoubtedly *P. Lessoni* of Bonaparte, as suggested by that distinguished author in Compt. Rend. 1853, p. 834. Numerous specimens in the Smiths. Mus. are from countries above given; the type described by Strickland in the Acad. Mus. is labelled "Central America."

The young of this bird bears a strong resemblance in colors only to the adult *Icterus melanocephalus* and *I. Audubonii*. Specimens in this young plumage, and others with the black color beginning to appear on the back, are in Smiths. Mus. Indifferently figured by Strickland, as above, but better than Hahn's figures, and recognizable with some exertion.

6. PENDULINUS MACULI-ALATUS (Cassin).

Icterus maculi-alatus, Cass. Proc. Acad. Philada. 1847, p. 332.
Jour. Acad. Philada., quarto, i. pl. 16, fig. 1.

Resembling the two species immediately preceding, but smaller than either, and having the greater wing coverts with ovate spots of white at their tips. Primaries narrowly edged with white in their terminal third. Head, neck and back, black; shoulders, lower part of back, rump and under parts orange-yellow; under wing coverts yellow. Bill bluish-black, pale blue at base of under mandible; legs dark brown. Bill moderate, curved, rather thick at base; wing rather long, third and fourth quills longest; tail rather long, somewhat graduated. Adult. Total length about 7½ inches; wing 3¼, tail 3⅛ inches.

Hab.—Guatemala; "Vera Paz" (Mus. Massena). Spec. in Mus. Acad. Philada.

The type of this species, described by me as above, remains the only specimen that I have seen, though it has been obtained at various localities in Guatemala by late European naturalists and travellers. This species is of the same sub-group as the two immediately preceding (*P. Wagleri* and *P. prosthemelas*), but is easily distinguished by the white spots on the wing coverts, which are peculiar, and a strong character. The type of this species in the Acad. Mus., from the Massena collection, is labelled "Coban, Vera Paz," which latter was printed erroneously "Vera Cruz" in my original description.

3. *Melanopsar.*

7. PENDULINUS CHRYSOCEPHALUS (Linnæus).

Oriolus chrysocephalus, Linn. Syst. Nat. i. p. 164 (1766).
Gracula chrysoptera, Merrem Beytr. Gesch. Voeg. (1784).
Briss. Orn. vi. Supp. pl. 2. Merr. Beytr. pl. 3. Vieill. Gal. i. pl. 86. Spix. Av. Bras. i. pl. 67.

specimens in the Smiths. Mus., from Ceará, Northern Brazil, have the *tibiæ* clear yellow. Numerous specimens in the Smiths. Mus. and Acad. Mus. from various localities in Brazil. This bird is probably that described by Hahn, as above cited. It is commonly brought in Bahia collections.

10. PENDULINUS CHILENSIS, Reichenbach.

Xanthornus chilensis, Reich. Denks. Acad. Vienna, 1853, pt. ii., p. 130. Cab. Jour. 1855, p. 55.

"Zunächst *Xanth. cajennensis*, doch kleiner, der Schweif viel kleiner, nicht stufenformig· kaum gerundet."

"Ziemlich häufig habe ich diesen schönen Vogel etwa 12 Stunden weit von Valparaiso in einer ebeden und etwas sumpfigen Gegend getroffen, an anderen Orten selten und bloss in vereinzelten Exemplaren."

Evidently a peculiar species, but which I have not seen, nor indeed any black species of this style from Western South America.

11. PENDULINUS DOMINICENSIS (Linnæus).

Oriolus dominicensis, Linn. Syst. Nat. i. p. 163 (1766).
Pendulinus flavigaster, Vieill. Nouv. Dict. v. p. 317 (1816).
Pendulinus viridis, Vieill. Nouv. Dict. v. p. 321 (1816)?
Briss. Orn. ii. pl. 12, fig. 3. Buff. Pl. Enl. 5, fig. 2.

Like the two preceding (*P. cayanensis* and *tibialis*) but smaller, and with the under tail coverts, sides of the abdomen and rump yellow (shoulders and *tibiæ* also yellow). All other parts of the plumage black. Middle of the abdomen black, uniform with the other plumage, but yellow on the sides (of the abdomen); under wing coverts and axillaries yellow. Bill and feet bluish black. Adult ♂. Total length about 8 to 8¼ inches, wing 3½ to 3¾, tail 3¾ inches.

Young? Throat black, shoulders and rump greenish yellow; all other parts of the plumage dark olive green, strongly tinged with yellow on the under parts. Tibiæ greenish yellow. Resembles the young of *P. hypomelas*, of Cuba.

Hab.—St. Domingo or Hayti. Spec. in Mus. Acad., Philada., and Mus. Smiths. Inst., Washington.

Exclusively inhabiting the Island of St. Domingo. Resembles not only the two preceding, *P. cayanensis* and *P. tibialis*, but also the two next succeeding, *P. portoricensis* and *P. hypomelas*, from all of which it is readily distinguished by its under tail coverts and *sides of the abdomen* being yellow, in which respect and otherwise generally it is well represented by Buffon in Pl. Enl., as cited above. Specimens in the Smiths. Mus. and Acad. Mus. are certainly from the Island of St. Domingo. Those in the Smiths. Mus. are from the valuable collection of Mr. A. C. Younglove, made in the vicinity of Port au Prince.

12. PENDULINUS PORTORICENSIS (Bryant).

Icterus dominicensis, var. portoricensis, Bryant, Proc. Nat. Hist. Soc. Boston, 1866, p. 254.
Turdus ater, Gm. Syst. Nat. i. p. 830, (1788)?
Turdus jugularis, Lath. Ind. Orn. i. p. 351 (1790)?
Buff. Pl. Enl. 559?

Resembling *P. dominicensis*, but with the yellow smaller in space on the rump, and restricted to the tibiæ and under tail coverts on the under parts (no yellow on the sides of the abdomen, as in *P. dominicensis*); also resembles *P. hypomelas*, of Cuba, but the adult of that species has the under tail coverts black, and the young plumages are quite different. Bill slightly curved, rather straighter and thicker than in *P. dominicensis*; wing moderate, third quill slightly longest; tail moderate; legs rather short.

Adult ♂. Shoulders, rump, under tail coverts and tibiæ yellow, all other parts black. Under wing coverts yellow, bill black, legs brownish black, a few of the longer upper tail coverts black, and the longer under tail coverts frequently tipped with black. Total length about 8½ inches, wing 3⅞ to 4⅛, tail 3¾ inches.

Young. Upper parts of body dull yellowish or reddish olive green, under parts reddish yellow tinged with green on the abdomen, quills and tail yellowish green. Adolescent. Like the young in the plumage of the head and body, but with the tail black, and with the black beginning to appear at the base of the bill and on the back. (The young differs from that of *P. hypomelas* and also from that of *P. dominicensis*).

Hab.—Porto Rico. Spec. in Mus. Acad., Philada, and Mus. Smiths. Inst., Washington.

Numerous specimens of this species are in the Smiths. collection, exclusively from Porto Rico. Related to and resembling the preceding *P. dominicensis* but distinguishable without difficulty by the yellow color on the under parts being

restricted to the tibiæ and under tail coverts. The young of this species is probably different entirely from that of *P. dominicensis*, and certainly from that of *P. hypomelas*, and resembles the figure in Pl. Enl. 559 in a greater degree than that of any other species known to me.

The extensive and valuable collections made in Porto Rico by Mr. Robert Swift and Mr. George Latimer, and presented by them to the Smithsonian Institution, contain all plumages of this species, as above described.

13. PENDULINUS HYPOMELAS, Bonaparte.

Pendulinus hypomelas, Bonap. Consp. Av. i. p. 433 (1850).
"Icterus hypomelas, Du Bus," Bonap. ut sup.
Icterus dominicensis, et virescens, Vig. Zool. Jour. ii. p. 441 (1827).
Psarocolius melanopsis, Wagl. Isis, 1829, p. 759.
De Sagra's Cuba, Ois. pl. 19, bis. (young).

Like the preceding, but with the under tail coverts black (not yellow, as in the two preceding, *P. dominicensis* and *P. portoricensis*), but frequently the shorter under tail coverts are dull gamboge yellow, quite different from the yellow of the tibiæ. Yellow space on the rump wide, as in *P. dominicensis*. Bill rather shorter and thicker than in either of the preceding, curved; wing moderate, third quill slightly longest; tail rather long, graduated; legs rather short.

Adult ♂. Shoulders, rump and tibiæ yellow, shorter under coverts of the tail dull gamboge yellow, under wing coverts yellow. All other parts of the plumage black. Longer upper coverts of the tail black, all the longer under tail coverts and frequently all the under coverts of the tail black. Bill bluish black, lighter bluish at the base of the under mandible; legs bluish black. Total length about 8 to 8½ inches, wing 3½ to 3¾, tail 3½ to 3¾ inches.

Young. Throat black, body above and below yellowish olive green, shoulders and rump greenish yellow, and in more advanced plumage, tibiæ yellow. Under wing coverts yellow, wings and tail brownish green. Adolescent. The black of the adult appearing on the back and breast. In young plumage this bird is *Icterus virescens* and *Psarocolius melanopsis*, as above.

Hab.—Cuba. Spec. in Mus. Acad., Philada., and in Mus. Smiths. Inst., Washington.

This is another of the black species with the rump or lower part of the back yellow, and allied to the two immediately preceding, *P. dominicensis* and *P. portoricensis*. It is not difficult to distinguish from either, by its black under tail coverts. Numerous specimens in the Smiths. Mus. are from the fine collection made in Cuba by Mr. Charles Wright, who most carefully obtained adults and young in all plumages.

14. PENDULINUS LEUCOPTERYX (Wagler).

Psarocolius leucopteryx, Wagl. Syst. Av. 16 (1827).
Icterus personatus, Temm. Pl. Coll. ii. liv. 81 (not paged nor dated).
"Oriolus mexicanus, Linn." Leach Zool. Misc. i. p. 8.
Oriolus nidipendulus, Gm. Syst. Nat. i. p. 390 (1788)?
Leach Zool. Misc. i. pl. 2. Edwards' Birds, v. pl. 243. Sloan Jam. pl. 258, fig. 3?

Middle and greater coverts of the wing white, forming a large space of that color (white) in the first half of the wing; shoulders yellowish green, uniform with the plumage of the upper parts of the body. Bill thick at base, somewhat curved; wing rather long, third and fourth quills longest; tail moderate or rather short; legs strong. Adult ♂. Entire upper parts of head and body greenish yellow, lighter on the rump, under parts yellow, tinged with green on the breast and sides. Front, lores and throat black (united and forming a mask), wings and tail black. Middle and greater coverts of the wing white, shorter quills widely edged with white. Under wing coverts pale yellow. Bill bluish black, pale blue at base of the under mandible; legs bluish black. Total length 8 to 8½ inches, wing 4¼, tail 3½ inches.

Adult ♀. Like the male, but with the upper parts more strongly tinged with green, and the white of the wing not so large; shoulders and scapulars frequently mixed with black.

Young. Like the female, but with the tail olive green; coverts of the wings [illegible] with white, all the quills narrowly edged with grayish white. Adolescent [illegible] ers of the tail black, others green. Shorter quills black, edged w[illegible] rh[illegible] brown.

Hab.—Jamaica. Spec. in Mus. Acad., Philada., and Mus. Smiths. Inst.,

This is a common enough, but quite peculiar species, n[illegible] in adult plumage the general colors of the young of se[illegible] cially of the smaller *P. spurius* of North America.

pany with the young of *P. dominicensis*, *P. hypomelas* and *P. spurius*, I am almost inclined to regard it as illustrating arrested development.

This bird is exclusively from Jamaica, so far as my information extends, and numerous specimens, now under examination, are in the very fine collection of the birds of that Island, presented to the Smithsonian Institution by William Thomas March, Esq., of Spanishtown, Jamaica. Numerous others in the Smiths. Mus. are in another fine collection from Metcalfe Parish, Jamaica, collected and presented by Professor George N. Allen.

In my opinion this bird is *Oriolus nidipendulus*, Gmelin, as above, founded on descriptions of two supposed species in Sloane's Jamaica, "The Watchy Picket or Spanish Nightingale" and "Another sort of the Watchy Picket." (Nat. Hist. Jamaica, ii. pp. 299, 300).

4. *Icterioides.*

15. PENDULINUS AURICAPILLUS (Cassin).

Icterus auricapillus, Cass. Proc. Acad. Philada., 1847, p. 332.

Jour. Acad. Philada. quarto, i. pl. 16, fig. 2.

Back, wings and tail black (no white marks in the wing). Bill moderate or rather short, thick at base, slightly curved; wing rather long, second and third quills longest; tail rather long, graduated; legs moderate. Adult ♂. Back, wings and tail clear lustrous black, without any white spots or marks whatever. Front, lores and throat black, united and forming a wide mask. Head, above, rump and entire under parts golden yellow, paler on the rump. Shoulders yellow, under wing coverts yellow, a few of the longer upper tail coverts black. Bill bluish black, legs dark brown. Total length 7 to 7½ inches, wing 3½ to 3¾, tail 3¼ to 3¾ inches. Younger. Entire head and under parts of body dull orange yellow, black feathers appearing on the throat; quills and tail feathers dark brown, rump greenish yellow.

Hab.—Northern South America, New Grenada, Venezuela, Trinidad, Mexico? Spec. in Mus. Acad., Philada., and Mus. Smiths. Inst., Washington.

About the size of *P. chrysocephalus* and, like that species, somewhat variable in all its dimensions, a specimen from the Island of Trinidad being the largest and another from Bogota, New Grenada, the smallest. A handsome and easily recognized species, with clear black wings and tail, without a vestige of white markings on either, and differing in that respect from the next succeeding, *P. cucullatus*. Shoulders in the present species, yellow; in *P. cucullatus*, black. Specimens in the Smiths. Mus. are from Bogota and Santa Martha, New Grenada. Two specimens in the Massena collection are labelled as from Mexico, in the handwriting of Mr. Victor Massena. Others in the Acad. Mus. are from Trinidad and Venezuela.

16. PENDULINUS CUCULLATUS (Swainson).

Icterus cucullatus, Swains. Philos. Mag., 1827, p. 436.

Cassin, B. of Cal. and Texas, pl. 8.

Middle coverts of the wing white, forming a wide diagonal band across the wing, near the shoulder. Bill rather long, curved, rather slender; wing moderate, third and fourth quills longest; tail rather long, graduated; legs moderate. Adult ♂. Back, wings and tail black, middle coverts of the wing white, shorter quills widely edged with white, primaries narrowly edged with grayish white. Front, lores and throat black, united and forming a wide mask. Head above, rump and entire under parts rich golden or reddish yellow; under wing coverts yellow. Bill bluish black, legs brownish. Total length about 7½ inches; wing, 3¼; tail, 3½ to 4 inches. Younger ♂. Black plumage of the back edged with yellowish green, tail narrowly tipped with white, yellow of the head tinged with dull green, and specimens occur in which the entire yellow parts of the plumage are dull greenish yellow, much paler, and of a different shade of yellow from that of the fully-matured bird.

Female. Upper parts dull ashy olive green, tinged with yellow on the head, under parts pale greenish yellow, clearer yellow on the middle of the abdomen and under tail coverts, ashy on the sides, wings ashy brown, coverts tipped with white, tail yellowish green. Total length about 7 inches.

Hab.—Mexico, Texas; Lower California. Spec. in Mus. Acad. Philadelphia, and Mus. Smiths. Inst., Washington.

About the size of the preceding *P. auricapillus*, and generally resembling it, but easily distinguished by its conspicuous white marks on the wings, and the shoulders being black. Numerous specimens in the Smiths. Mus., from Cordova and Mirador, and various localities in the States of Tamaulipas and Coa-

and rather short tails. All are of entire symmetry and compactness of structure, and the group represents, in my opinion, the perfection of the family *Icteridæ*, and is therefore, I think, to be properly regarded as the typical genus. My business, in the present series of memoirs, is, however, mainly with species, and I have not ventured upon such arrangement.

1. *Hyphantes.*

1. HYPHANTES BALTIMORE (Linnæus).

Oriolus Baltimore, Linn. Syst. Nat. i. p. 162 (1766).
Oriolus tricolor, Müll. Syst. Nat. Supp., p. 87 (1776).
Catesby Carolina, i. pl. 48. Buff. Pl. Enl. 506. Vieill. Gal. i. pl. 87. Wils. Am. Orn. i. pl. 1, vi. pl. 53. Aud. B. of Am. pl. 12, oct. ed. iv. pl. 217.

Bill straight, pointed; wing with the first four primaries longest and nearly equal; tail moderate. Adult. Fine reddish orange; head, back, wings and middle tail feathers black. Shoulders orange, greater coverts tipped with white, quills edged with white, tail at base orange, middle feathers black in their terminal two-thirds, others with a medial space black, and largely tipped with orange. Bill bluish, legs bluish brown. Female. Like the male, but with the black parts tinged with brown, and the orange parts paler, and sometimes tinged with green; younger, and frequently mated: the female has the head above and back yellowish or grayish olive, quills brown, tail olive green. Young. Like the young female, but with the quills blacker. Adolescent. Black appearing on the head and throat, tail feathers partly black. Total length 7½ to 8 inches; wing 3¾, tail 3 to 3¼ inches.

Hab.—Eastern North America; Mexico: Central America. Spec. in Mus. Acad., Philada. and Mus. Smiths., Washington.

Specimens of this well-known species in the Smiths. Mus. are from numerous localities throughout the United States, east of the Rocky Mountains, from Eastern Mexico, Guatemala and Costa Rica; many of them, in collections from Mexico and Central America in very fine adult plumage. One of the most beautiful and familiarly-known birds of the United States. This beautiful little species varies in the shade and *depth* of its orange colors in both males and females. Specimens in the Acad. Mus., from Jalapa, Mexico, are amongst the finest in plumage that I have seen.

2. HYPHANTES BULLOCKII (Swainson).

Xanthornus Bullockii, Swains. Philos. Mag., 1827, p. 436.
Psarocolius auricollis, DeWeid, Reise Nord. Am. i. pl. 367 (1839).
Aud. B. of Am. pl. 388, oct. ed. iv. pl. 218.

Size of the preceding, front and wide supercilliary stripe orange. Bill straight, pointed, wing rather long, second and third quills longest, tail moderate, rounded. Adult. Stripe through the eye, head above, back and throat, black. Wings brownish black, greater coverts and quills widely edged with white, under wing coverts orange yellow. Front and supercilliary stripe, sides of neck and entire under parts of body fine orange yellow, paler on the abdomen. Lower part of back and rump orange yellow, frequently tinged with greenish. Tail, with the middle feathers brownish black in their terminal two-thirds, yellow at base; outer feathers orange yellow, tipped with brownish black. Young. Upper parts yellowish olive green, darker and frequently mottled with brownish black on the back. Total length about 7 to 7½ inches; wing 4, tail 3¼ inches.

Hab.—Western North America; Mexico. Spec. in Mus. Acad. Philada., and Mus. Smiths., Washington.

Apparently a frequent species of all the temperate countries of North America on the Pacific Ocean, and inhabiting also a very extensive central region, including the Rocky Mountains. Well represented in the plate of Audubon's folio edition, but indifferently in the octavo. Not intimately resembling any other species.

2. HYPHANTES ABEILLEI (Lesson).

Xanthornus Abeillei, Less. Rev. Zool., 1839, p. 101.
Oriolus Costototl, Gm. Syst. Nat. i. p. 385 (1788)?

About the size of the preceding two species, and strictly of the same generic group. Entire upper parts of head and body black. Under parts with the throat and *sides black*. Narrow line over the eye, sides of the neck and middle of the under parts of the body orange yellow. Wings black, greater coverts white, quills edged with white. Tail with the middle feathers brownish black, other tail feathers yellow, tipped with brownish

Buff. Pl. Enl., 482. Swains. B. of Braz., pl. 1. Shaw Nat. Misc. x. pl 365. Prevost Ois. Exot., pl. 71. Dubois Orn. Gal., pl. 43. D'Orb. Cuv. Orn. pl. 37. Briss. Orn ii. pl. 8.

Bill large, slightly curved, wing long, third quill longest, tail moderate or rather short, feet strong. Adult. Back and rump bright scarlet; all other parts of the plumage lustrous black; bill bluish or greenish yellow; feet brownish black. Sexes alike in colors. Younger. Back and rump yellowish scarlet; other parts of plumage dull brownish black; bill dull greenish yellow, darker at base. Total length, male, about 12 inches; wing 7⅛, tail 4 to 4½ inches; female smaller.

Hab.—South America; Central and Eastern? Spec. in Mus. Acad., Philada., and Mus. Smiths., Washington.

Apparently one of the most abundant birds of South America. In all collections in this country, usually from Bahia, Rio de Janeiro, St. Katherine, and other points in Eastern Brazil. Perhaps the same also from Guiana and Trinidad. In this species the bill is not so large as in the next succeeding, (*C. affinis*,) but in all other characters the two birds are very similar, and probably ought to be regarded as identical.

2. Cassicus affinis, Swainson.

Cassicus affinis, Swains. B. of Braz.

"Cassicus crassirostris, Aliq." Bonap. Compt. Rend., 1853, p. 833.

Swains. B. of Braz., pl. 2.

To be distinguished from the preceding by its thicker bill, which is, so far as I can see, the principal character, and but a doubtful species. Not having a sufficient number of specimens which are clearly this bird, to form a satisfactory series or to show gradations, I give it provisionally as distinct, and very nearly as defined by the Prince Bonaparte in Compt. Rend. xxxvii. p. 833.

Like the preceding, and about the same size, but with the bill much larger, especially at base, straighter and wider; wing long; tail rather short. Back and rump bright scarlet; all other parts of the plumage lustrous black; bill bluish yellow; feet brownish black. Total length about 12¼ inches; female smaller.

Hab.—Northern South America: "Cayenne." Spec. in Mus. Acad., Philada.

The Prince Bonaparte's diagnosis of this species, as above cited is:—"Grande; d'un noir luisant; la couleur rouge étendue; le bec droit, mais tres-dilaté, énorme à la base." Several specimens in the Massena collection present all these characters, and especially the last, the bill being, indeed, quite entitled to be considered *enormous* at base. The scarlet of the back is of greater extent than in either of the two next succeeding, and perhaps also of the preceding, (*C. hæmorrhous*,) as stated by the Prince Bonaparte, as above cited; but I cannot see that this bird is of a more lustrous black than the preceding, as also stated by him in descriptions of the two supposed species—"noir mat" and "noir luisant."

Specimens in the Acad. Mus. from "Cayenne."

3. Cassicus uropygialis, Lafresnaye.

Cassicus uropygialis, Lafres. Rev. Zool., 1843, p. 290.

Cassicus curvirostris, Lafres. Rev. Zool., 1847, p. 218.

Hahn Voeg., pt. vi. pl. 6?

Like the two preceding, (*C. hæmorrhous* and *C. affinis*,) but smaller, and with the bill curved, and the scarlet of the back and rump more restricted. In all specimens now before me, the scarlet on the upper parts is restricted to the rump, and much smaller in extent than in either of the preceding, and frequently assuming a yellowish or copper lustre, which is the case also in the succeeding species, *C. microrhynchus*). Entire other plumage lustrous black, bill greenish yellow, feet dark brown. Bill thick at base, both mandibles curved, wing long, tail moderate or rather short. Total length about 10 to 10½ inches, wing 6⅛, tail 5¼ to 5½ inches. Female smaller.

Hab.—Northern South America: Bogota: Rio Atrato. Spec. in Mus. Smiths. Inst., Washington, and in Coll. Mr. Lawrence, New York.

Apparently a species of fair respectability. The specimens before me could readily be distinguished from either of the preceding, but perhaps not so easily from the next succeeding, (*C. microrhynchus*,) which it more strongly resembles. The more restricted scarlet of the body above is a reliable character, and the bill always presents a degree of curvature not seen in the preceding.

[April,

6. CASSICUS VITELLINUS, Lawrence.

Cassicus vitellinus. Lawr. Proc. Acad. Philada. 1864, p. 107.

Like the preceding (*C. persicus*), but with the bill thicker and more curved, the yellow of the tail much more restricted and reversed, being shortest on the outer feathers. Adult. Entire plumage lustrous black, except the back and upper and under tail coverts and a large space on the greater wing coverts, which are rich yellow, inclining to orange (darker and of a richer shade than in the preceding). Bill yellow, generally tinged with greenish, especially the under mandible; feet dark brown. "Eye opal color, bill greenish yellow, legs black." (Mr. F. Hicks' label, Panama). ♂. Total length 11½ to 12 inches, wing 6½ to 7, tail 4½ to 4¾ inches. ♀. Total length about 9½ inches, wing 4 to 4⅛, tail 3¾ to 4 inches.

Hab.—Northern South America, New Grenada, abundant at Panama, Turbo, Atrato River, Central America? Spec. in Mus. Smiths., Washington; Mus. Acad., Philada., and coll. Mr. Geo. N. Lawrence, New York.

Clearly a distinct, and in the numerous specimens now under examination, an easily recognized species. It seems to be uniformly rather larger and with the bill thicker than *C. persicus*. The fine rich and deep yellow of the back in the adult of this species, I have never seen in its relative, and is correctly pointed out by Mr. Lawrence as a specific character, as above.

Numerous specimens in the Smiths Mus., from Panama, and in Col. Michler's collection from the Atrato River. Specimens in the Acad. Mus. labelled doubtfully as from "Mexique."

7. CASSICUS MELANURUS, nobis.

Prevost Ois. Exot. pl. 71? Hubner, Samml. Voeg. pl. 99?

In the Massena collection, now a part of the ornithological collection of the Philadelphia Academy, there is a single specimen of a species resembling and allied to *C. persicus*, but with the tail and under tail coverts entirely black. This specimen is labelled as a female and from Guyaquil, in the handwriting of M. Victor Massena, Prince D'Essling, and is the only one that I have ever seen of the species.

Adult ♀. Smaller than either of the preceding, though strictly of the same subgroup, and with the tail entirely black, and the under tail coverts black. A wide transverse band, immediately above the under tail coverts, yellow. Rump and a large spot on the wing, at its insertion with the body, yellow. The longer tail coverts black. All other parts, including the head, neck and back, and entire under parts of the body, wings and tail, black. Bill light colored, feet dark. Bill smaller than in *C. persicus*, pointed; wing moderate or rather long, third quill longest; tail moderate, legs rather short.

Total length 8¾ inches, wing 4¼, tail 3¾ inches. (Female).

Hab.—Guayaquil (Massena Coll.) Spec. in Mus. Acad., Philada.

2. *Cassiculus.*

Genus Cassiculus, Swains. Faun. Bor. Am. ii. p. 276 (1831).

8. CASSICUS MELANICTERUS (Bonaparte).

Icterus melanicterus, Bonap. Jour. Acad. Philada. iv. p. 389 (1825).

Icterus diadematus, Temm. Pl. Col.

Cassiculus coronatus, Swains. Philos. Mag. 1827, p. 436.

Temm. Pl. Col. 482. Jard. & Selb. Ill. Orn. ii. pl. 45.

Crested, tail entirely yellow, except the two middle feathers and the outer web of the outer feather, which are black. Large, bill straight, tapering, pointed; wing long, third and fourth quills longest, tail rather long; head with a crest of long and slender feathers. Adult ♂. Back and upper and under tail coverts and tail (except two middle feathers) yellow, middle and greater wing coverts yellow. All other parts of the plumage lustrous black, bill bluish or greenish yellow, legs dark brown. Outer web of outer tail feather usually dark brown, and the yellow feathers of the tail are frequently spotted with brown at their tips. Total length about 12 to 13 inches, wing 6 to 6½, tail 5½ to 6 inches. Female smaller, and with the dark parts of the plumage usually tinged with brown. Total length about 9½ inches. Young. No crest, dark parts of plumage brownish black, yellow parts tinged with green, all the yellow tail feathers edged on both webs with dark brown. An irregular large spot on each side at the base of the upper mandible dull yellow, throat with numerous whitish spots.

Hab. Mexico. Abundant at Mazatlan, Acapulco. Spec. in Mus. Acad., Philada., and Mus. Smiths., Washington.

The only species of this group having a well defined crest, and easily recog-

nized. Abundance of specimens in the fine collections of Col. Grayson and Capt. Xantus, from Mazatlan. Specimens in Mus. Acad. labelled Acapulco.

9. CASSICUS LEUCORHAMPHUS (Bonaparte).

Xanthornus leucoramphus, Bonap. Att. Sc. Ital. 1843, p. 404.
Cassiculus leucoramphus, Bonap. Consp. Av. i. p. 428 (1850).
Cassicus chrysonotus, D'Orb. et Lafres. Mag. Zool. 1838, p. 3?

Bill straight, pointed; tail long; wing long, third and fourth quills longest; legs strong. Adult. Back and spot on the wing coverts bright yellow, all other parts lustrous black. Tail uniform black, upper tail coverts black at their ends, yellow at their bases. Bill bluish at base, with its point or terminal half, ivory white; feet brownish black (no yellow on the abdomen nor under tail coverts, those parts being black, uniform with other parts of the plumage). Younger or female? Entire black parts of plumage tinged with brown, and yellow parts with greenish; bill dark brown at base, dull white at tip.

Total length, male 11 to 12 inches, wing 6, tail 5½ inches. Female? about 9½, wing 3¾ to 4, tail 4¾ inches.

Hab.—Northern South America, New Grenada, Ecuador. Spec in Mus. Acad., Philada., and Mus. Smiths., Washington.

This is a large species, with a sharp, rather small bill and long tail, easily distinguished from any other bird of this group. It is frequent in collections from Bogota. This species has the tail and entire under parts of the body clear uniform black, without yellow in either. There can be little doubt that *C. chrysonotus*, D'Orb. et Lafres., is the young of this bird, but that the student may judge for himself I give the original description of that supposed species, next succeeding.

Of this fine species numerous specimens are in the Mus. Acad., labelled "Bogota," and in the Mus. Smiths., from Ecuador and New Grenada. If the same as *C. chrysonotus*, which I think quite probable, that name has precedence for the species.

10. CASSICUS CHRYSONOTUS, Lafresnaye.

Cassicus chrysonotus, Lafres. Guer. Mag. 1838, p. 3.
D'Orb. Voy. Am. Ois. pl. 52.

"Affinis hæc species *Cassico icteronoto;* sed differt rostro rectiore, cauda longiore et coloribus. Rostrum in exuvia flavo-albidum, in viva basi obscure cæruleo nebulatum, apice depressiusculum; casside frontali angusta tereti quamvis posterius rotundata. Supra et subtus totus major dorso postico et uropygio tantum flavo-aurantius, tectricibus caudæ superis ac inferis nigris; alæ his *Gussici icteronoti* longitudine æqualis, sed cauda multo longiore maris nigredine supra nitente, fœminæ obscura; hujus nonnullæ alarum tectrices mediæ punctis aut striis minimis aurantius terminatur. An majorum macularum in aliis speciminibus indicium?"

"Longit. *maris*, 31 cent., *fœminæ* 27 cent."
"Caudæ *maris* 14½ cent. *Icteronoti* 11½ cent."
"*Habit.* in Bolivia, Yungas." (Lafresnayes' description as cited above).

The tail, in the figure cited, is represented as plain black. This species I have not seen, at least no specimen to which this description applies, nor like the figure in D'Orb. Voy. above cited. My present impression and suspicion is that it is the young of the immediately preceding species *C. leucoramphus*, and, though figured without the yellow spot on the wing, that character is clearly indicated in the description, as above.

11. CASSICULUS FLAVICRISSUS, Sclater.

Cassiculus flavicrissus, Sclat. Proc. Zool. Soc. London, 1860, p. 276.

"Nigerrimus: dorso postico, tectricibus alaribus dorso proximis, crisso et rectricibus ad basin flavissimus: rostro plumbeo, apice albicante; pedibus nigris."
"Long. tota maris 10·0, alæ 5·8, caudæ 4·0; feminæ 8·5, alæ 4·4, caudæ 3·3."
"*Hab.* in rep. Equator."
"Mus. P. L. S."
"Four examples. Irides and bill blue: not shy; very noisy, in flocks among large trees in the deep bush; stomach contained seeds and insects." (Dr. Sclater's description, as above cited).

This species is unknown to me and not in any American collection to my knowledge. It is evidently a strongly marked and peculiar species, the base of the tail being yellow, which is its special character in the group *Cassiculus*.

(Genus Archiplanus, Cabanis).

12. CASSICUS ALBIROSTRIS, Vieillot.

Cassicus albirostris, Vieill. Nouv. Dict. v. p. 364. (1816).
Xanthornus chrysopterus, Vig. Zool. Jour. ii. p. 190 (1825).
Iapus dubius, Merr. Grub. Ency. xv. p. 277.
Zool. Jour. Supp. pl. 9.

Small, much resembling the preceding (*C. leucoramphus*) and with the same colors, but much smaller. Head with somewhat lengthened and probably erectile feathers; bill thick at base, straight, pointed; wing long, third and fourth quills longest; tail rather long, feet strong. Adult. Rump and large spot on the wing coverts yellow, all other parts deep black, upper tail coverts and tail black. Bill yellowish or ivory white, frequently greenish at base; legs brownish black. Younger. Entire black plumage tinged with brown, and yellow parts with greenish; bill dark brownish, tip paler.

Total length, male, about $8\frac{1}{2}$ inches, wing 4, tail 4 inches. Younger or female, total length about $7\frac{1}{2}$, wing $3\frac{1}{2}$, tail $3\frac{1}{2}$ inches.

Hab.—Brazil, south-eastern South America? Spec. in Mus. Acad., Philada., and Mus. Smiths., Washington.

In colors and general characters this bird much resembles the preceding (*C. leucoramphus*), but is smaller, with the feathers of the head more lengthened and crest-like, and has the yellow of the rump much more restricted. It seems to belong strictly to the same group, and in my opinion is certainly of the group *Cassiculus*. Specimens in the Mus. Smiths. from the Rio Parana, Brazil, and in the Acad. Mus. labelled Brazil.

3. *Ostinops.*

(Genus Ostinops, Cab. Mus. Hein., i. p. 187 (1851).

13. CASSICUS CITREUS (Müller).

Oreolus citreus, Müll. Syst. Nat Supp., p. 87 (1776).
Oriolus cristatus, Bodd. Tab. Pl. Enl., p. 20 (1783).
Oriolus cristatus, Gm. Syst. Nat. i. p. 387 (1788).
Xanthornus decumanus et maximus, Pall. Spic. Zool., pt. vi. pp. 1. 3 (1769).
Buff. Pl. Enl., 344. Pall. Spic. Zool., pt. vi. pl. 1. Swains. B. of Braz., pl. 32. Dubois Orn. Gal., pl. 34.

Large, with a crest of linear, procumbent feathers; bill large, very thick at base; wing long; fourth quill usually longest; tail long, graduated; legs strong. Adult. Tail feathers yellow, except the two in the middle, which are black; lower part of the back, and upper and under tail coverts, dark chestnut. All other parts of plumage black, generally lustrous, and frequently with a brownish shade; bill yellow; legs brownish black. Younger. Brownish black, with entire upper and under parts of body tinged with dull reddish chestnut, tail coverts and tail as in adults. Total length, male, about 15 to 18 inches; wing $8\frac{1}{2}$ to 10, tail 8 to 9 inches. Female, 13 to 15, wing $6\frac{1}{2}$ to 7, tail 7 to $7\frac{1}{2}$ inches.

Hab. South America; Brazil; Ecuador; New Grenada; Trinidad. Spec. in Mus. Acad., Philada., and Mus. Smiths., Washington.

The largest specimens of this abundant species in the series now before me are from Ecuador, and the smallest are from the island of Trinidad; but I fail entirely to detect differences or to discriminate between those from various localities. The female is decidedly the smaller. Numerous specimens in the Mus. Smiths., Washington, and Mus. Acad., Philadelphia.

The finest-plumaged as well as largest specimens that I have seen of this bird are in the very valuable collection made in Ecuador, by the Hon Charles R. Buckalew, late Minister of the United States to that country, and presented by him to the Smithsonian Institution.

14. CASSICUS VIRIDIS (Muller).

Oriolus viridis, Mull. Syst. Nat. Supp., p. 87 (1776).
Xanthornus virens, Schreber, Naturforscher, xviii, p. 1 (1782).
Oriolus viridis, Bodd. Tab. Pl. Enl., pl. 20 (1783).
Cassicus viridis, Vieill. Nouv. Dict. v. p. 364 (1816).
Oriolus rufirostris, Shaw, Gen. Zool. Aves. vii. p. 416 (1809).
Buff. Pl. Enl., 328. Naturforsch. xviii. pl. 1.

Large, bill very thick at base, tapering rather suddenly, elevated in front, straight; wing long, third quill longest; tail rather long; legs and feet very strong. Head with a crest of very slender, recumbent feathers. Adult male. Tail yellow, except the two middle feathers, which are dark-greenish brown; back and upper tail coverts, lower part of abdomen, tibiæ and under tail coverts dark chestnut. Quills black. All other parts of plumage dark yellowish green, lighter on the under parts. Bill greenish yellow, legs black. Female. Smaller than the male, but similar in colors. Young. Tibiæ green. Total length, male, about 18 inches; wing about 10, tail 7 to 7½ inches. Female. Total length about 14; wing 7½ to 8, tail 5½ inches.

Hab.—Northern and Eastern South America. Spec. in Mus. Acad., Philada.

This large species is to be found in all collections, and has long been known to naturalists, but, like rather numerous common species, must be studied carefully in connection with its later-discovered allies. Specimens in the Mus. Acad. have no labels stating locality, but this bird comes abundantly in collections from Brazil, and I have seen it from more northern countries of South America.

15. CASSICUS YURACARIUM, D'Orbigny et Lafresnaye.

Cassicus yuracares, D'Orb. et Lafres. Mag. Zool., 1838, p. 2.

Cassicus Devillii, Bonap. Consp. Av. i. p 427 (1850).

D'Orb. Voy. Ois., pl. 51, fig. 1. Castelnau Voy. Ois., pl. 19, fig. 1.

Large, resembling the preceding, and about the same size, but with a large naked space at the base of the lower mandible, and the bill black, tipped with yellow. Back, wings and abdomen dark chestnut, tail yellow, except two middle feathers, which are reddish brown. Head, neck and breast and upper part of back yellowish green; quills brownish black, edged externally with dark chestnut; legs black. Female like the male, but smaller. Younger like the adult, but with the chestnut on the under parts more restricted, and on the back mixed with green. Head (in adult) with a crest of slender recumbent feathers, wing long, third quill longest, tail moderate or rather long, legs very strong. Total length, male, about 18 inches; wing 9½, tail 7½ inches. Female. Total length about 15; wing 7½, tail 6½ to 7 inches.

Hab.—Northern South America; New Grenada; Bolivia; Peru. Spec. in Mus. Acad., Philada., and Mus. Smiths., Washington.

About the size of the common *C. viridis*, but easily distinguished by its chestnut-colored back and abdomen, and the large naked space at the base of the lower mandible. Numerous specimens in the Mus. Smiths., from various localities in New Grenada, and in Mr. Lawrence's collection from the "Rio Napo." Specimens in the Acad. Mus., from the fine collection made by the Hon. John Randolph Clay, while Minister of the United States to Peru. Very handsomely figured by D'Orbigny, as above.

16. CASSICUS ATRO-VIRENS, D'Orbigny et Lafresnaye.

Cassicus atro-virens, D'Orb. et Lafres. Mag. Zool., 1838, p. 1.

D'Orb. Voy. Am. Ois., pl. 51, fig. 2.

Like the preceding, but smaller and of a darker green color. Bill very thick at base, tapering abruptly; wing long, second, third and fourth quills longest and nearly equal; tail rather long, legs strong. Adult? Back and upper and under tail coverts dark chestnut, a large frontal space pale yellow; all other parts of the body, above and below, and wings, dark olive green, darker on the head, paler on the throat and neck. Tail with the middle and outer feathers dark olive, nearly uniform with the body; intermediate feathers (of the tail) yellow. Bill greenish yellow, legs black. Tibiæ green. Quills brownish black. Total length about 15 inches; wing 8½ to 9, tail 7 inches.

Hab.—Bolivia. Spec. in Mus. Acad., Philada.

The only specimen of this species is D'Orbigny's type in the Massena collection, (Mus. Acad.) It is singularly like all the preceding, but of a darker green color, nearly uniform on all parts, but rather darker on the head above, and back. This darker color is the principal character on which rests the species, so far as I can discover. In this specimen there is no crest, but the feathers of the head are somewhat lengthened only. I regard it as possible that this species and the next may be identical, but such is not my opinion at present. Fairly represented in D'Orbigny's plate.

17. CASSICUS ALFREDI, Des Murs.

Cassicus Alfredi, Des Murs, Castelnau's Voy. Am. Ois., p. 67 (1855).

"Ostinops angustifrons." Jules Verreaux' label in Mus. Smiths.

Casteln. Voy. Am. Ois., pl. 19, fig. 2.

Several specimens in the Acad. Mus. and Smiths. Mus. seem to be this species. All are labelled "Bogota," and four specimens in the Smiths. Mus. are certainly correct, and so are other specimens in Mr. Lawrence's collection. This bird differs from *C. viridis* and *C. atrovirens*, in having the head, in front, yellow, and this yellow color strongly tinging the neck and the throat; and, in nearly all specimens, the body, above and below, is more or less tinged with reddish brown, sometimes strong, but frequently faint. Nearly all the feathers of the crown are lengthened and crest-like in a greater degree than in *C. atrovirens*. At present my impression is that this is a distinct species, though no specimen that I have seen seems to be entirely adult.

About the size of *C. viridis*, and of the same general form and colors, but with the wings and tail longer, and with a large space in front, and frequently extending over the top of the head, yellow. Back and rump reddish brown; the latter (rump usually with a yellowish tinge); sides of abdomen and under tail coverts reddish or yellowish brown. Entire other plumage olive green; head, in front, yellow, throat and neck strongly tinged with yellow. Wings brownish black, middle and outer feathers of tail greenish brown, other tail feathers yellow. Bill pale yellow, legs dark brown. Total length, male, about 17 inches; wing 9½, tail 7½ inches. Female? Total length about 13; wing 7¼, tail 6½ in.

Hab.—Northern South America; New Grenada. Spec. in Mus. Acad. Philada., and Mus. Smiths., Washington.

This bird comes occasionally in Bogota collections, though not commonly. It seems to have the wings rather longer, and perhaps the tail also longer, than in either *C. viridis* or *C. atrovirens*, and my opinion is that it is distinct from either. It differs from *C. angustifrons* in having the bill always yellow, (not black at all ages, as in *C. angustifrons*).

In the splendid collection of Bogota birds, recently presented to the Smithsonian Institution by the Hon. A. A. Burton, late Minister of the United States to New Grenada, there are four specimens of this species, and others also, from Bogota, are in the Acad. Mus., Philadelphia, and in the collection of my friend Mr. Lawrence, of New York. This seems to be clearly the bird described and figured by Des Murs, as above, the lengthened feathers of the head being quite peculiar and characteristic, and partially shown in Castelnau's plate, as above.

18. CASSICUS ANGUSTIFRONS, Spix.

Cassicus angustifrons, Spix Av. Bras. i. p. 66 (1824).

Spix Av. Bras. i. pl. 62.

Differs from all the preceding species in having the bill black at all ages. Large; a few feathers of the crown lengthened and crest-like; bill straight, thick at base, flattened late; al'v, not so large as in the preceding species. Wing long, fourth quill longest; tail long, rounded, feet strong. Adult. Entire plumage greenish brown or dark chocolate color, lighter and tinged with yellowish green on the head and throat, and, in some specimens, on the under parts of the body. Back and upper and under tail coverts dark reddish chestnut. Wings brownish black, middle feathers of the tail brownish black, others yellow, bill and feet brownish or bluish black, lighter and sometimes nearly white at the tip. Younger. Head and neck strongly tinged with dull yellow, and tail tinged with green. Sexes alike and distinguished mainly by size? Total length, male, about 18 inches; wing 10½, tail 9 inches. Female. Total length about 15½; wing 8, tail 7½ inches.

Hab. Northern South America, Upper Amazon; Rio Napo. Spec. in Mus. Acad., Philada., and Mus. Smiths., Washington.

This large species is always distinguishable by its black bill, and is darker and differently colored in plumage than either of the preceding. Specimens in the Smiths. Mus. are from Lieut. Herndon's collection on the Amazon River, and in Mr. Lawrence's collection from the Rio Napo. In the Acad. Mus. fine specimens are labelled "Pebas, Haut-Amazon." Very indifferently figured by Spix, as above, but recognizable by its black bill, and altogether a peculiar and entirely respectable species, not troubled with near relations.

19. CASSICUS BIFASCIATUS, Spix.

Cassicus bifasciatus, Spix Av. Bras. i. p. 65 (1824).

Spix Av. Bras. i. pl. 61.

Bill flattened laterally or compressed, a large naked space at the base of the under mandible, which space is integral, not divided into *two* spaces, as in the two next succeeding

species). Head with a few long crest-like feathers, not so long nor so narrow as in *C. guatimozinus*, but longer than in *C. Montezumæ*. Wing moderate or rather long, third quill longest, tail rather long, rounded.

Adult. Head and breast brownish black, entire upper parts of body, abdomen, under tail coverts and *tibiæ light chestnut*. Tail yellow, the two middle feathers dark brown. Bill with its basal two-thirds black, tip yellowish white. Legs brownish black. Sexes alike. Total length, male, 18 to 20 inches; wing 9¼ to 10, tail 8 inches. Female. Total length about 14 to 15 inches; wing 8, tail 6 to 6½ inches.

Hab.—Northern South America; Para. Spec. in Mus. Acad., Philada.

This species and the two next succeeding are much alike in colors and general form. In this species the naked space is always integral, as above described, and the tibiæ light chestnut, uniform with the abdomen and upper parts of the body.

Specimens in the Acad. Mus. certainly from Para, Northern Brazil. Spix's figure, above cited, is near enough for practical purposes, as the Professor of mathematics says.

20. Cassicus Montezumæ (Lesson).

Cacicus Montezuma, Less. Cent. Zool., p. 33 (1830).

Less. Cent. Zool., pl. 7. Gervais Atl. Zool., pl. 33.

Like the preceding, but with the naked space on the cheek partially divided by a line of short, imbricated feathers above the lower edge of the lower mandible, and the *tibiæ black*. Head with a few linear, crest-like feathers, (short and inconspicuous, not so long as in either *C. bifasciatus* or *C. guatimozinus*). Colors much as in the preceding; head, breast and tibiæ brownish black, body above and below dark chestnut, tail yellow, except the two middle feathers, which are brownish black. Basal half to two-thirds of bill black, tip yellowish or reddish white, feet brownish black. Sexes alike. Total length, male, 18 to 20 inches; wing 10, tail 8 inches. Female smaller.

Hab.—Mexico; Central America. Spec. in Mus. Acad. Philada., and Mus. Smiths., Washington.

Always has the naked space at the base of the under mandible divided by an imperfect line of short feathers, as represented in Lesson's plate, cited above, and the tibiæ black, (not light chestnut as in the preceding). This seems to be an abundant species of Mexico and Central America. Lesson's type in Acad. Mus. is labelled "Mexique," others are from San Juan de Nicaragua. Numerous specimens in Smiths. Mus. are from the very fine collections made by Dr. C. Sartorius near Vera Cruz, Mexico, by Mr. O. Salvin in Guatemala, and Mr. J. Carmiol at Angostura and San Carlos, Costa Rica.

21. Cassicus guatimozinus (Bonaparte).

Ostinops guatimozinus, Bonap. Compt. Rend., 1853, p. 833.

Larger than either *C. bifasciatus* or *C. Montezumæ*, darker-colored, and the crest feathers longer and more slender; bill thicker at base, and naked space at base of lower mandible completely divided by a line of short feathers. Bill very thick and wide laterally at base, straight, pointed, wing moderate or rather long, tail rather long, legs strong. Adult. Head and entire under parts black, upper parts of body and under tail coverts dark-purplish chestnut, tail yellow, except the two middle feathers, which are brownish black. Bill with the basal two-thirds black, tip yellowish white, legs brownish black. Younger? Sides purplish brown, otherwise as in adult. Total length, male, about 21½ inches; wing 10½, tail 8¼ inches. Female smaller. Total length about 15½ inches.

Hab.—New Grenada; "Rio Truando;" "Turbo;" Spec. in Mus. Smiths., Washington.

This species is of the same general form as the two immediately preceding, but is much darker in colors, and not difficult to distinguish. The only specimens that I have seen are two in Capt. Michler's collection, made during a survey of the Rio Atrato, New Grenada, now in the Smiths. Mus. The crest in this species is in front, directly at the base of the upper mandible, and is composed of very narrow, almost thread-like feathers, probably erectile.

4. *Ocyalus.*

(Subgenus Ocyalus, Waterhouse, Proc. Zool. Soc., London, 1840, p. 183.)

22. Cassicus latirostris, Swainson.

Cassicus latirostris, Swains. Cat. Cy., p. 358 (1838).

Cassicus (Ocyalus) popayanus, Waterh. Proc. Zool. Soc. London, 1840, p. 183.

Bill thick at base, very wide and convex in front, wing long, primaries attenuated at their ends, tail rather short, legs moderate or rather weak. Adult. Head above dark chestnut, body above and below rich purplish black, wing lustrous greenish black, four middle feathers of the tail lustrous black, others yellow, widely tipped with black, and outer feathers edged with black on their outer webs. Bill pale bluish yellow, legs brownish black. Sexes alike? Younger. Back tinged with the same chestnut as the head, and wings nearly plain black, the green lustre being scarcely apparent. Total length about 11 inches; wing 5 to $5\frac{1}{2}$, tail 4 to $4\frac{1}{2}$. Female slightly smaller.

Hab.—Northern South America; New Grenada; ("Popayan," Mr. Waterhouse;) Peru, (Mr. Swainson). Spec. in Mus. Acad., Philada.

This is a richly-colored bird in adult plumage, and represents a strongly-marked subgeneric group in the genus *Cassicus*, if not entitled to generic distinction with the next species. The general form is short and compact, with the tail also short, or rather so, and the wings long, with the primaries attenuated at their points, feet rather slender. As Mr. Swainson says truly, a strong "fissirostral type." The only specimens that I have seen are male and female in Mus. Acad., Philadelphia, which were obtained from Messrs. Verreaux, Paris, labelled as from New Grenada.

23. CASSICUS WAGLERI, G. R. Gray

Cassicus Wagleri, G. R. Gray, Gen. Birds, ii. p. 342 (1847).

Gray's Gen. ii. pl. 85.

Larger than the preceding, but strictly of the same subgroup. Bill very large and convex in front, wing long, primaries strongly attenuated at their ends, tail rather short, graduated, feet moderate. Adult. Entire head, lower part of back, sides of abdomen and under tail coverts dark chestnut; wings, back and body below lustrous greenish black; tibiæ brownish black. Two middle feathers of the tail and outer webs of two external feathers clear black, other tail feathers yellow. Bill yellowish green, legs brownish black. Head with a low filiform crest-like feathers. Sexes alike. Younger. Entire body above and below tinged with dull chestnut, nearly uniform in shade with the head, black of the back and body beneath, in the adult, scarcely distinguishable in the young; wings dull black with little greenish lustre. Bill brownish, yellow at point; "bill in living bird yellowish white," (Prof. F. Sumichrast.) "Iris light blue," (Mr. J. Carmiol.) Total length, male, about 11 inches; wing $8\frac{1}{2}$ to 9, tail $5\frac{1}{2}$ inches. Female. Total length about 12 inches; wing $7\frac{1}{2}$, tail $4\frac{1}{2}$ to 5 inches.

Hab.—Mexico; Central America; New Grenada. Spec. in Mus. Acad. Philada., and Mus. Smiths., Washington.

Abundance of specimens in the Smiths. Mus. from the magnificent collections of Prof. F. Sumichrast in Mexico, and Dr. A. Von Frantzius and Mr. Julian Carmiol in Costa Rica. The latter labelled "San Jose," "Angostura," "Turrialba" and San Carlos." Also from Guatemala, and Panama and the Rio Truando, New Grenada. In the younger bird, the attenuation at the ends of the primary quills is not so strongly marked as in the adult. This interesting species is accurately and handsomely figured by Mr. G. R. Gray in his great work, "The Genera of Birds," cited above.

5. *Clypicterus.*

(Genus Clypicterus, Bonap. Consp. Av. i. p. 426.)

24. CASSICUS OSCRYI, Deville.

Cassicus Oscryi, Dev. Rev. Zool., 1849, p. 57.

Castelnau, Voy. Am. Ois., pl. 18, fig. 3.

" Bec [illegible] à sa base formant un bourrelet arrondi sur la partie frontale, [illegible] la commissure de l'arête; bords, bord des paupières garni de petites [illegible] noirs, [illegible] d'un beau roux châtain, plus foncé sur le derrière de la tête, plus [illegible] vert olive sur la partie frontale; gorge et poitrine d'un jaune plus ou moins [illegible] tirant un peu gris sous la gorge; ventre mêlé de châtain et de jaune [illegible]. Ailes [illegible] noir; les deuxième, troisième, quatrième, cinquième et [illegible] bords [illegible] nervures et au tiers de leur longueur à peu près, une bande [illegible] la sixième; les grandes [illegible] du côté du bord interne une bande rousse châtain, puis une [illegible] noirâtre [illegible] couleur jusqu'à la baguette du milieu laquelle est [illegible] Pieds [illegible]; le pouce et son ongle très-forts [illegible] à [illegible] petites médianes, et le bord externe de la première [illegible] Long du bec 2 c. 2 m. Larg. du renflement du bec 2 c. 3 m. Long. de la [illegible]

"*Hab.*—Pébas, sur le Haut-Amazone." (Deville, as above.) "Rubro-castaneus; pectore fronteque flavo-olivaceus; remigibus fuscis: cauda flavissima, rectricibus mediis margineque externarum olivaceis." (Bonap. Consp. Av. i. p. 426.)

These are the original descriptions of a species of which the Prince Bonaparte makes a genus, as above, but which I have not seen. The figure in Castelnau's Voy., above cited, looks much like a young bird, but is different from any species known to me. This bird is given in the catalogue of the Baron Lafresnaye's collection, now in the museum of the Boston Natural History Society.

(The following may be an additional species of this genus.)

25. CASSICUS LEUCURUS, De Wied.

? Cassicus leucurus, De Wied, Beitr. Naturg. Bras. iii. p. 1245 (1831).

"Der weisschwänzige Cassicke. Wird *Joncongo* genannt."

"Er lebt, nach Aussage der *Camacan*-Indianer, häufig an den Ufern des Rio Pardo im Sertong. Der Vogel ist schwartz, mit weissem Schwanze. Sein Nest hängt er gesellschaftlich, wie der *Japu*, *Guasch* und *Japui*, an den Bäumen über dem Wasser auf. Es hat die Gesbalt wie bei obigen Arten. Ich habe diesen Vogel durch Zufall nich zu sehen bekommen."

Not subsequently determined, and, of course, may have been erroneously reported to the Prince Maximilian.

V.—Genus AMBLYCERCUS.

(Genus Amblycercus, Cabanis Mus. Hein. i. p. 190.)

1. AMBLYCERCUS SOLITARIUS (Vieillot).

Cassicus solitarius, Vieill. Nouv. Dict. v. p. 364 (1816).

Cassicus nigerrimus, Spix, Av. Bras. i. p. 66 (1824).

Spix, Av. Bras. i. pl. 63.

Entirely black, except the bill, which is yellowish white. Head with the feathers of the crown somewhat lengthened, and probably partially erectile; plumage of the back long, ample; wing rather short; fourth quill longest; tail long, rounded; legs strong. Bill straight, flattened laterally or compressed. Black plumage with slight greenish lustre in adult. Sexes alike. Total length about 10½ inches; wing 5, tail 5¼ inches.

Hab.—Northern and Central South America; Brazil; Ecuador; Bolivia; (Dr. Sclater). Spec. in Mus. Acad., Philada.

A clear black species, frequent in collections from Brazil. The feathers of the head are lengthened in this bird, and the plumage of the back, though ample, is not so much so as in the next succeeding, which is also a plain black species. Specimens in the Acad. Mus. from Brazil, and in Mus. Smiths. from the collections of the Hon. Charlés R. Buckalew in Ecuador, and of Com. T. J. Page in Paraguay. Spix's attempt to represent this respectable species, as above, miscarried palpably.

2. AMBLYCERCUS PREVOSTII (Lesson).

Amblyramphus Prevostii, Less. Cent. Zool., p. 159 (1830).

Less. Cent. Zool., pl. 54. Gervais, Atl. Zool., p. 34.

Much resembling the preceding, but smaller, and with the feathers of the crown short, (not lengthened, as in the preceding). Bill thick at base, flattened laterally, and not so much convex above as in the preceding. Wing rather short, rounded; fourth and fifth quills longest; tail rather short; legs moderate; plumage of the back very profuse, lengthened. Adult. Entirely black, with little or no lustre; bill yellowish white; legs dark brown. Sexes alike. "Eye yellowish white, legs light-lead color, bill greenish yellow." (Mr. Frederick Hicks, Panama.) Total length, male, about 9½ inches; wing 4¼, tail 4½ inches. Female. Total length about 8¾ inches; wing 3¾, tail 3¾ inches.

Hab.—Mexico; Central America; New Grenada. Spec. in Mus. Acad. Philadelphia, and Mus. Smiths., Washington.

This smaller species much resembles the preceding in form and color, but is quite distinct. The most immediately available characters are the smaller size and lengthened feathers of the back in the present bird, and the bill is more flattened on the culmen. In a large number of specimens no one has the feathers of the crown lengthened, as in the preceding. Numerous specimens in the Smiths. Mus. are from the fine collections of Dr. C. Sartorius at Mirador, near Vera Cruz, Mexico, of Prof. F. Sumichrast and Mr. J. Carmiol in Costa

Rica, and also from Guatemala and Panama, New Grenada. Specimens in Acad. Mus. from Mexico and New Grenada, and in all other collections from everywhere else in Mexico and Central America.

Here endeth the *Icteridæ*, so far as the knowledge of the present writer doth warrant him in attempting to compass.

May 7th.

MR. VAUX, Vice-President, in the Chair.

Twenty-four members present.

The following was presented for publication:

"Notes on Micropus leucopterus." By Henry Shimer, M. D.

A letter was read from George W. Tryon, Jr., proposing to deposit his Conchological Library with the Academy on certain conditions, which, on resolution, was accepted. The conchological works consist of about 100 bound volumes, and 60 unbound volumes and pamphlets. With this addition to the Library of the Academy, it will contain nearly every known work published on conchology.

Prof. Leeds made some remarks on the inspiration of oxygen as a remedial agent. He stated that he had inhaled ten gallons, and a friend twelve gallons, without any apparent bad effect.

May 14th.

The President, DR. HAYS, in the Chair.

Forty members present.

The following was presented for publication:

"Contributions to the History of the Vertebrates of Mesozoic Periods in New Jersey and Pennsylvania." By E. D. Cope, A. M.

The death was announced of Dr. C. M. Diesing, of Vienna, Correspondent.

May 21st.

The President, DR. HAYS, in the Chair.

Twenty-seven members present.

The following were presented for publication:

"Descriptions of five new Unionidæ, &c." By Isaac Lea, LL. D.

"Description of a new genus of Plants." By Alphonso Wood.

May 28th.

The President, DR. HAYS, in the Chair.

Thirty-seven members present.

The following were elected correspondents:

E. E. Adams, D. D.; Alexander Winchell, Ann Arbor, Mich.; Henry Pleasants, Pottsville, Pa, and D. Antonio Raimondi, M. D., Lima, Peru.

The following were elected members:

Asa Whitney, George Whitney, John R. Whitney, Edward Clarke, Clarence H. Clark, Frank H. Clark, Theodore H. Morris, O. Nichols Beach, James N. Whelen, Wm. A. Whelen, Alexander Whilldin, Orlando Crease, Andrew I. Sloan, D. Murray Cheston, M. D., Edw. C. Knight, Frank Hazeltine, Wm. R. White, Jr., Daniel H. Rockhill, Franklin S. Wilson, Rev. J. G. Ralston, and Clarence S. Bement.

On favorable report of the Committee, the paper of Prof. Cope, read May 14th, was ordered to be published in the Journal.

On favorable report of the Committees, the following were ordered to be published:

Notes on MICROPUS (LYGARUS) LEUCOPTERUS, Say, ("The Chinch Bug.") With an account of the great Epidemic Disease of 1865 among Insects.

BY HENRY SHIMER, A. M. M. D.,

Mount Carroll, Illinois.

During the few years preceding the summer of 1865, I was very favorably located for observing the great grain enemy of the West—"The Chinch Bug"—in the midst of one of the most important agricultural regions in the valley of the Mississippi, and with some personal interest in that direction. I gave the subject the most thorough investigation in all its bearings, during a period of several years, and therefore believe that I observed some facts worth recording, although it is an old subject—one upon which much has been written—much, however, upon mere conjecture or ephemeral observation, without sufficiently thorough investigation; hence, often widely departing from the truth. (See the various printed reports.)

With the wide-spread destruction that followed the rise and progress of the "Chinch Bug," most western men are quite well acquainted, and many in pocket sadly familiar. Under the genial influence of a favorable clime, the "chinch bug" attained the maximum of its development in the summer of 1864, in the extensive wheat and corn fields of the valley of the Mississippi; and in that single year, three-fourths of the wheat and one-half of the corn crop were destroyed throughout many extensive districts, comprising almost the entire North-west, with an estimated loss of more than one hundred millions of dollars in the currency that then prevailed; which, if thus continued for one hundred years, and estimating the value of money at the legal rates of our State, annually, would amount to the enormous sum of one hundred and thirty-seven thousand seven hundred and ninety-six millions of dollars lost to the farming community alone. By estimating the effect of this loss upon the various associated interests of the nation, and by observing the tendency of this insect, unchecked, to spread everywhere in this our rapidly developing country, we can easily see that it would fall short of the true estimate to place the entire loss to this continent, if uninterruptedly continued for one hundred years, equal to a sum sufficiently vast to engulf the present wealth of the world, and all from an apparently "insignificant insect"—a "bug," popularly unworthy of notice, as a single specimen.

In view of these great facts, I gave the subject my most untiring attention; the insect enemies of the chinch bug were carefully watched, everything bearing upon it was noted, hoping that some practical method might be developed, or some enemy discovered, that would lead us to hope for its ultimate control, if not destruction.

The ravages of the "chinch bug" have been marked with varying paroxysms, from year to year, for a long time, among the records of which it will be seen that Mr. Walsh (Transactions Ill. Agricultural Society,) estimates the loss in

Illinois alone, in the year 1850, to have been four millions of dollars. What fatality produced the subsequent paroxysms in its development, and so greatly diminished its destructiveness for several years, so that it scarcely excited much attention, it was not my province to behold; and I believe no record has been made.

The pleasant dry summers, and the snowy protection of the accompanying winters for several successive years, so fostered these insects that the harvestmen found them in every field in unnumbered millions in 1864, blasting the fairest prospects of the bone and sinew of the land. It was my privilege, in the spring of 1864, to observe the parent insects fulfil the principal office of nature by propagating their species, and quietly die from natural laws after the great object of their being was accomplished. Day after day, it was the greatest pleasure of all my numerous entomological observations, in a scientific point of view, while I deplored their devastations, to mark the progress of the vast hosts of their off-spring towards the imago state everywhere around me. From the platforms of the grain reapers in the prairie harvest fields, it would have been no difficult task to gather these little insects by bushels; and when the dry straw of the wheat fields no longer afforded them nourishment, they took up their line of march for the corn-fields, according to their usual well-known custom, on this occasion almost literally covering the ground in many places: sometimes gathering together into piles, and here casting their skins. This, being observed carelessly by farmers and others, leads them to declare that "the 'chinch bugs' were destroying each other," "that they were dying," &c.; the dry shells remaining behind being mistaken for the insect itself.

I have seen the columns of these insects a full week on the march across meadows and pasture fields from the wheat to the corn field; and have even seen them swim a small stream of water that crossed their line of march. In former years the few border rows of corn, together with the "fox-tail grass," (Setaria,) carelessly left among the corn in cultivating, usually satisfied them. This latter grass is usually attacked in preference to the corn.

In 1864 whole corn fields were overrun by them: the stalks, especially below the ears, blackly covered through the day, were bleeding and literally raw from their numerous punctures. At length, when they had attained the perfect state during the warm part of bright sunny days, they took to their wings, and literally filled the atmosphere, not much unlike an April snow storm. This interesting phenomenon induced many to believe that they were leaving the country: but it was for an entirely different purpose—that of choosing their mates—for they never fly except in the love season. After a few days they might be found paired in corn fields, and other proper breeding grounds producing a new generation. At this time, in the month of August, 1864, my attention was very favorably directed to a small field of tender, thickly-sown corn for fodder, where they congregated in immense numbers, and continued until the frosts of autumn had killed the corn that they did not consume, and developed their progeny in unnumbered millions. During the day they resorted to the stalks of corn to feed upon the juice, but they passed the night usually upon the ground.

The two principal insect enemies that I observed among this autumn brood were a very common species of "lady bird," (*Hippodamia maculata*,) and a species of the "golden-eyed fly," (*Chrysopa Illinoensis*, Shimer, Proceedings Entomological Society, vol. iv, p. 208). Both these enemies were very numerous—especially the former, which could be counted by hundreds on every square yard of ground after shaking the corn; but the chinch bugs were so numerous that these hosts of enemies made very little perceptible impression among them. After the early autumn frosts, they left their feeding grounds, on foot, in search of winter quarters; none could be seen on the wing, as at harvest time, above alluded to. For a winter retreat, they resorted to any convenient shelter they might chance to find, as long grass, weeds, boards, pieces of wood rails, fallen tree leaves, &c., &c.

young spring wheat, barley, &c., under loose clods of earth, old cornstalks, and about the roots of the grain, in cracks of the ground, &c. In some badly affected fields a dozen or more to every wheat stalk.

May 26th.—The chinch bugs are just beginning to lay their eggs, and some fields of wheat are greatly damaged already from the feeding of the perfect insect. The stalk at the surface of the ground is black from their punctures, the sheaths of the outer leaves being scarred and dead; the tops are pale yellow, and often withering; many stalks are as dead and dry as hay. I saturated some saw dust with coal tar, and mixed some quick lime among it, so that it might be in a good condition for handling, and sowed it thickly broadcast over a portion of my wheat field where the bugs were very numerous.

May 27th—29th.—I find the chinch bug eggs more abundant, mostly on the roots and stalks beneath the ground, sometimes in loose clusters of a dozen or more. They are on the roots, where they cross the numerous cracks in the ground; less frequently on the stem, at the surface of the ground. These eggs are scarcely visible to the naked eye. Many of the bugs are in copulo, with their heads in opposite directions; the females are the larger, dragging the males when alarmed. The bugs refuse to leave the part of the field where I sowed the tarred sawdust, so there is but little hope of driving them from their once chosen grounds by the reasonable application of strong smelling drugs.

June 10th.—I saw the first larvæ chinch bugs of the season, small red fellows, on the roots; eggs very numerous. Actually saw a female laying an egg on my hand, under a slight pressure.

The egg is elongate ovate, about four times as long as wide (as nearly as I could determine with fine mathematical instruments ·04 in. long and ·01 in. wide; of course this lacks the precision of a micrometer measurement); pale amber white when first laid, but becoming of a reddish color, like the young, as the season of incubation advances. A moderate amount of moisture is necessary to the development of the egg. Those put into a pasteboard box in my room did not hatch, but shrivelled or dried up.

June 17th.—Millions of very small red young chinch bugs; they are on the roots, in crevices, and on the stems, under clods, &c., beneath the ground. The egg-laying season has terminated; the parent bugs are principally dead. Those that died before the rains a few days ago are mouldy; others, in great numbers, in many places covering the ground, apparently are just dead. During the past month, as I learned from many observations, they passed most of their time beneath the ground, in the crevices, &c., so that although millions of them existed in every field, a casual observer would believe that but a few were there. But their work being finished, they came out to die. A very few imago, scarcely one of a hundred, yet remain alive.

July 1st.—I ploughed a few acres of badly affected barley beneath the ground, to see what effect it would have upon the bugs, hoping that it might destroy them, and thus save the adjoining corn.

July 16th.—A farmer four miles from here informed me that a black coleopterous insect was destroying the chinch bugs on his farm very rapidly; and although I found his supposition to be an error, yet I found many dying on the low creek-bottom land from the effects of some disease, while they are yet in the larvæ state—a remarkable and rare phenomenon for insects thus in such a wholesale manner to be dying without attaining their maturity, and no insect enemy or other efficient cause to be observed capable of producing this important result.

July 22d.—Saw the first matured young chinch bug observed this year. Wings perfect, body pale reddish white, fresh from its last moulting. It is just 77 days from the time I saw the first egg, and 42 days since I saw the first larva.

see larvæ, pupa and imago promiscuously together, more especially towards autumn. It is also highly probable that none of the first brood survive the following winter, but that they all lay their eggs and die as does the spring brood. A close observer will, however, notice that of the parent bugs in the spring a very few may be seen among the larva and pupa of the spring brood. Quite probably they are such females as never mated nor fulfilled the great law of their being by propagation, and many of the males, for, like many other insects, the chinch bug lays its eggs and dies.

It is generally believed among entomologists that insect enemies are the most efficient means in nature for exterminating noxious insects; but in this remarkable fact in the history of insects, the great epidemic of 1865 (there can be no doubt about this being an epidemic disease, because the insects died without attaining their maturity), we find a greater enemy, the greatest insect enemy ever recorded, a dreadful "plague," that in a few days almost utterly annihilated a race of beings living in the northern part of the valley of the Mississippi, outnumbering all the human beings that have ever lived on this planet since the morning of Creation.

This disease among the chinch bugs was associated with the long-continued wet, cloudy, cool weather that prevailed during a greater portion of the period of their development, and doubtless was in a measure produced by deficient light, heat and electricity, combined with excessive humidity of the atmosphere, whereby an imperfect physical ("bug") organization was developed. The disease was at its maximum during the moist warm weather that followed the cold rains of June and the first part of July. The young chinch bug spent a great portion of its time on or near the ground, where its body was colder than the atmosphere; hence, upon philosophical principles, there must have been an excessive precipitation of watery vapor in the bronchial tubes. These are the facts in the case, but in the midst of the great obscurity that envelops epidemic diseases among men, it would be only idle speculation to attempt to define the cause more definitely than the physiological laws already observed seem to indicate. At all events it will require many years of warm dry summers, and accompanying winters of plenty of snow for protection, to reinstate the lost innumerable armies of this insect.

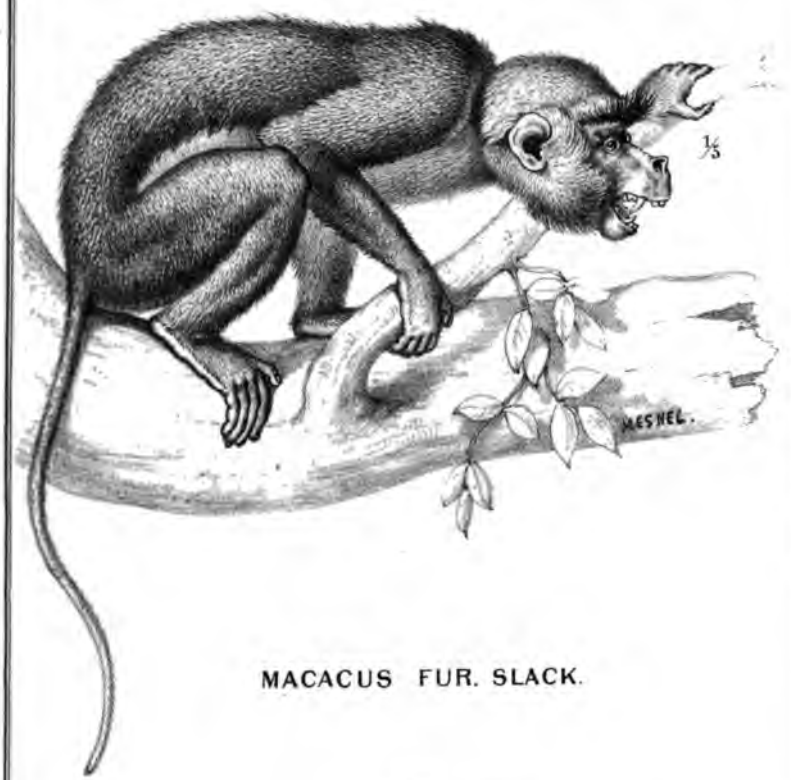
During the summer of 1866 the chinch bugs were very scarce in all the early spring, and up to near the harvest I was not able, with the most diligent search, to find one. At harvest I did succeed in finding a few in some localities.

This epidemic disease was not confined to the chinch bug alone. During the summer of 1865 I saw the larvæ of the common striped cucumber bug (*Diabrotica vittata*) on the *stems* of melon and cucumber vines, above ground, a very unusual place for them. Always before this I have found them on the root, beneath the surface of the ground. This unusual position was evidently to escape the effect of some unnatural conditions. During the latter part of the summer of 1865 the imago were very much less numerous than common.

The apple-worm (the larva of *Carpocapsa* (*Tinea*) *pomonella L.*) was very numerous in 1863–4, affecting almost every apple. In 1865–6 they were very much less numerous. From observation I conclude that the disease was produced by the same cause that swept away the chinch bugs.

The potato-worm (*Sphinx quinque-maculatus*) was very numerous in 1864, doing much damage to tomatoes, &c. The pupæ were extremely abundant in the soil in the spring of 1865, but in autumn no observed larvæ had survived.

The *Locustadæ* (grasshoppers) were also severely afflicted; the numerous dead, of all states, were easily seen everywhere, clasping the grass, weeds, &c., in the embrace of death. I might add much more of my observations on these insects, and greatly extend the list of afflicted species, but my object, to prove that epidemic diseases are *incomparably the most* important agents in all nature in destroying noxious insects, has been sufficiently illustrated. Neither is this a mere isolation, for I have observed diseases among various insects for the past 25 years.



MACACUS FUR. SLACK.

Bowen & C° Imp. Philada.

Descriptions of Five New Species of UNIONIDÆ and One PALUDINA of the United States.

BY ISAAC LEA.

UNIO BISSELIANUS.—Testa lævi, oblonga, sublenticulari, inæquilaterali, postice obtuso-angulata, antice rotunda; valvulis subcrassis, antice aliquanto crassioribus; natibus prominulis, ad apices concentrico-undulatis; epidermide tenebroso-oliva, obsolete radiata; dentibus cardinalibus crassiusculis, compressis, subelevatis crenulatisque; lateralibus sublongis, lamellatis subcurvisque; margarita carnea et valde iridescente.

Hab.—Bissel's Pond, Charlotte, N. C., C. M. Wheatley.

UNIO CLINCHENSIS.—Testa lævi, triangulari, ad latere planulata, valde inæquilaterali, postice obtuse angulata, antice rotundata; valvulis crassis, antice crassioribus; natibus prominentibus; epidermide luteola, ad latere radiata; dentibus cardinalibus crassis, subcompressis corrugatisque; lateralibus percrassis, curtis et obliquis; margarita alba et iridescente.

Hab.—Clinch River, Tenn., Pres. Estabrook, and French Broad River, Dr. Edgar.

UNIO JEWETTII.—Testa lævi, oblonga, subinflata, valde inæquilaterali, postice obtuse angulata, antice rotundata; valvulis subtenuis, natibus prominulis, ad apices concentrico-undulatis; epidermide fusca; dentibus cardinalibus parvis, obliquis, compressis; lateralibus, prælongis lamellatisque; margarita alba et iridescente.

Hab.—Florida, Col. Jewett.

MARGARITANA COLUMBENSIS.—Testa lævi, elliptica, valde inflata, subequilaterali, postice obtuse angulata, antice rotundata; valvulis tenuibus; natibus prominentibus, ad apices undulatis; epidermide luteola, obsolete radiata; dentibus cardinalibus parvis, sublobatis; margarita alba et aliquanto iridescente.

Hab.—Tombigbee River, near Columbus, Miss., W. Spillman, M. D.

ANODONTA YOUCONENSIS.—Testa lævi, elliptica, valde inflata, valde inæquilaterali, postice subbiangulata, antice rotundata; valvulis subcrassis; natibus prominulis, aliquanto undulatis; epidermide tenebroso-fusca, radiata; margarita albida.

Hab.—Head waters of the Youcon, Arctic America.

PALUDINA SPILLMANII.—Testa transverse exillissime striata, obtuse carinata, subelliptica, subtenui, imperforata; spira aliquanto exserta; suturis impressis, anfractibus quinis, subinflatis; apertura parviuscula, ovata, intus cæruleo-alba; labro acuto, parum sinuoso; columella parum incrassata.

Hab.—Jackson Co., Alabama, W. Spillman, M. D.

Description of a New Genus of Plants.

BY ALPHONSO WOOD.

BREVOORTIA, nov. gen.

Perianthium corollaceum (coccineum), tubuliforme, supernè ventricosum fauce remissè contractâ, regulare, persistens; limbo 6-partito, laciniis ovatis, obtusis, arctè revolutis, sexies tubo brevioribus. Corona (flava) brevis, erecta, tribus squamis truncatis integris, bis latioribus quam longis, constituta. Stamina 3, squamas excedentia. Filamenta per totam longitudinem tubo adnata, interioribus laciniis opposita, ac cum squamis alternantia. Antheræ liberæ oblongo-lineares, extrorsæ, apice obtusæ, basi profundè bifidæ ibique insertæ. Ovarium liberum, ovatum, triloculare. Ovula in loculis 3—5, uniseriata. Stylus continuus, erectus, longitudine perianthii. Stigma capitatum, trilobatum. Capsula?

Herba glabra, scapigera (bulbosa?). Folia 5—7, linearia, canaliculata, obtusa. Scapus teres, erectus, rigidus, 2—4 pedalis, longitudine foliorum. Flores 8—12, in apice scapi umbellati, unciales, nutantes, spathâ 4-valvi suffulti; pedicellis 1—2 policaribus diffusis; bracteis ovato-lanceolatis, purpureis.

B. IDA-MAIA. Grows in deep rich soil on high hills of the Trinity Mt. Range, Shasta county, California, near the stage-road from Shasta City to Yreka. I saw it here in full bloom about the first of June, 1866, occupying a space of several acres. The leaves are very long and narrow, and recurved. The scape, although slender, is rigidly erect, of three, or even four feet high, round, smooth, wavy, and bearing at the top an umbel of about twelve scarlet or bright red flowers, nodding on their slender, recurved, unequal foot-stalks. The form of the perianth is between cylindric and pyriform, about one inch in length, with the limb very short, of six valvate lobes. Before opening, these lobes are chrome-green in color, making a peculiar contrast. After opening they are yellow. The three leaves (scales) constituting the corona are yellow, one line in length by two or three lines in breadth, occupying the place of, but in no wise resembling abortive stamens. Unfortunately I found no specimen in fruit; neither did I secure a bulb, so deeply buried were they, and so impatient of delay were my fellow passengers. The whole plant possesses singular grace and beauty, and few are better worthy of a place in the flower garden.

The new genus Brevoortia is nearly allied to Brodiæa (Smith), Dichelostemma (Kunth), Stropholirion (Torr.), &c., of the Natural Order Liliaceæ, tribe Asphodeleæ. All have the floral envelopes more or less united, with only three perfect stamens. Other three stamens (usual to the Liliaceæ) are variously transformed, as in the following Synopsis:

LEUCOCORYNE, three abortive filaments subulate or clavate.

BRODIÆA, three abortive filaments lanceolate-spatulate.

DICHELOSTEMMA, three abortive filaments petaloid, bifid,—a 3-lobed crown.

STROPHOLIRION, three abortive filaments petaloid, 2-parted,—a 6-lobed crown.

BREVOORTIA, three abortive filaments petaloid, entire, twice broader than long, truncate, with no semblance of stamens remaining. The perianth also wholly diverse in form from that of the four preceding.

This plant was first noticed by Mr. Burke, stage-driver, in his daily route, and by him my own attention was first called to it. He had given it the name of "*Ida May*, in affection for his little daughter,"—a name quite appropriate, moreover, as on the Ides (*i. e* the 15th) of May, the plant begins to flower. Mr. Burke was confident that this was its only locality. Probably, however, it may yet be found in many other places in northern California.

We dedicate this genus to J. Carson Brevoort, of Brooklyn, a Regent of the University of the State of New York, himself an earnest naturalist, and a liberal patron of science.

June 4th.

The President, DR. HAYS, in the Chair.

Twenty-eight members present.

The death of Miss Margaretta H. Morris, member of the Academy, was announced.

June 11th.

The President, DR. HAYS, in the Chair.

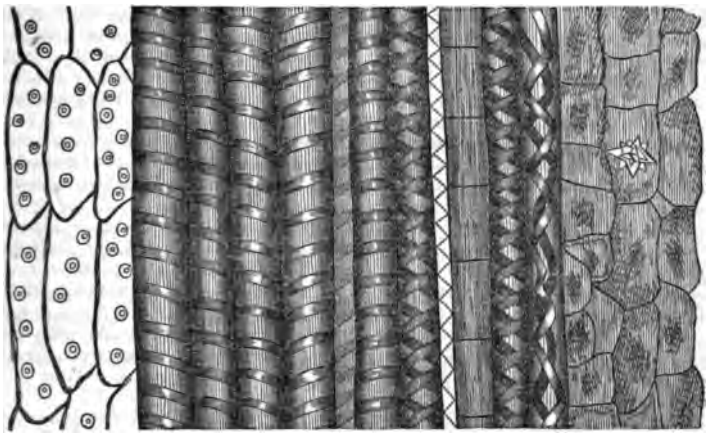
Thirty-six members present.

The following was presented for publication:
"On the Families of the Raniform Anura." By E. D. Cope.

June 18th.

MR. CASSIN, Vice-President, in the Chair.

Eleven members present.



Longitudinal section of Salisburia, showing wood cells of the first year's growth, with spiral ducts intervening between them and the pith.

Dr. H. C. Wood, Jr., called the attention of the Academy to the existence of true spiral ducts in the wood of *Salisburia adiantifolia*, a Japanese tree belonging to the Taxineæ, now extensively cultivated in Europe and this country, and remarkable for its leaves more closely resembling in general appearance those of some ferns than any exogen. He stated that, as far as he was aware of, ducts had not hitherto been found in any coniferous wood, and even in the Salisburia their position and arrangement were eminently peculiar,—different from those of the Angiosperms. The only layer of the wood in which they were produced was that formed during the first season of growth, all the other rings being composed simply of prosenchymatous cells, of the ordinary coniferous type. The medullary rays in the Salisburia are not continuous and well pronounced, but the points of the wood wedges formed during the first season are usually separated by well pronounced prolongations of the pith. It is in the extreme points of these wedges that the spiral ducts are situated, from three to six or even more deep. They are of small size, the largest scarcely exceeding the wood cells in diameter, the smallest scarcely one-third as large,—and contain some one, some two spiral fibres. The veins of the leaves are also composed largely of spiral ducts, but in these there is a strong tendency in the component cells of the vessel not fully to unite and be merged into one another; in many instances their end walls are not absorbed, so that each cell is distinct and perfect.

June 25th.

The President, DR. HAYS, in the Chair.

Thirty members present.

The Committee to which was referred the communication entitled

"On the Families of the Raniform Anura," by E. D. Cope, reported in favor of its publication in the Journal.

The following letter was read from Mr. Geo. W. Tryon, Jr.:

DR. JOS. LEIDY:

Dear Sir.—A few weeks since I proposed to deposit my collection of Shells, &c., in the Museum of the Academy, subject to certain conditions. These conditions were, as I learn from the minute book, "unanimously agreed to," but they do not appear at length on the minute book, nor upon the record of Donations to the Museum, and my letter containing them appears to have been mislaid or lost.

I now repeat the conditions upon which I make the deposit of my shells, in order that they may be again acted on by the Academy and, if accepted, entered at length upon the minutes of the meeting.

1st. That all the species and varieties not now in the Academy's collection, as well as specimens from localities different from those now contained in it, shall be intercallated with the Academy's collection, but distinguished by their labels.

2d. That names of species representing authors' types shall never be changed.

3d. That the Academy will, immediately upon occupying its new Hall, provide a sufficient number of horizontal or table cases to display advantageously the entire collection; the cases to be constructed so as to prevent the ingress of dust.

4th. I reserve the right to sell the duplicates as well as the cases in which my collection is now contained, for the purpose of augmenting, with the proceeds of such sale, the Conservators' Fund of the Conchological Section of the Academy.

5th. That the Conservators elected by the Conchological Section of the Academy, as well as the scientific Standing Committees of the said Section, shall have access to and control of the entire conchological collections of the Academy, subject to the supervision of its Curators.

6th. That none of the specimens deposited by me shall be loaned or removed from the custody of the Academy.

The deposit will never be withdrawn provided that the Academy shall faithfully observe the above conditions in every particular.

Yours, truly, GEO. W. TRYON, JR.

The following gentlemen were elected members:

S. Morris Waln and B. Hammit.

The following were elected correspondents:

C. William Zaremba, St. Joseph's, Mich.; H. E. Dresser, London; M. H. Crosse, Paris; Dr. Paul Fischer, Paris; M. J. R. Bourguignat, Paris; R. P. Montronzier, New Caledonia; Geo. French Angas, Port Jackson; Henry Adams, London; Arthur Adams, London; Dr. J. C. Chenu, Paris; Hon. Edw. Chitty, Kingston, Jamaica; J. B. Gassies, Bordeaux; Sylvanus Hanley, London; J. Gwyn Jeffreys, London; Dr. H. C. Kuster, Cassel; Arthur Morelet, Dijon; Dr. Louis Pfeiffer, Cassel; Prof. O. A. L. Mörch, Copenhagen; Prof. F. H. Troschel, Bonn; G. S. Von Mohrenstern, Vienna; Fred. Cailliaud, Nantes; A. P. Server, Lyons; Petit de la Saussaye, Paris; Wesley Newcomb, M. D., Oakland, Cal.; Dr. J. G. Cooper, San Francisco, Cal.; R. E. C. Stearns, San Francisco, Cal.; Prof. F. Poey, Havanna; Dr. J. Grundlach, Havanna; Dr. R. A. Philippi, Santiago, Chili; H. Benson, Cheltenham, Eng.; Henri Drouet, Troyes; Dr. Auguste Baudon, Bauvais,

[June,

cranium. He stated that individuals of Trachycephalus first belong to the genus Hyla, subsequently to Scytopis, later to Osteocephalus, and finally to Trachycephalus, and that no additional characters existed at any of these stages, to render such references inexact. He said that the characters of the inferior genera might be regarded in one sense as larval, and that as the genus Siredon had passed into Amblystoma by loss of larval characters, there was no reason why the preceding genera might not, under suitable circumstances, do the same, respectively. He said also that the specific characters were recognizable while the Trachycephalus exhibited the generic type of Hyla and others, suggesting that the specific characters might be more permanent than the generic. A similar case recorded by Agassiz was mentioned,—that of Chelopus guttatus, where the yellow spots appear before it has lungs or its family characters.

July 2d.

The President, DR. HAYS, in the Chair.

Twenty-four members present.

July 9th.

The President, DR. HAYS, in the Chair.

Eighteen members present.

Dr. Genth made some observations on certain doubtful minerals which he had lately examined. *Barnhardtite*, the peculiar copper ore which stands between Chalcopyrite and Variegated Copper Ore, occurs amongst the ores of Bill Williams Fork, Arizona.

From the same locality he observed *Brochantite*, both in foliated masses and small but brilliant crystals. A former pupil of his, Mr. N. S. Higgins, received in Arizona an Arsenide of Copper, the nature of which he did not fully ascertain, which proved to be the interesting species *Whitneyite*, of which we have now four localities: two on Lake Superior, one in Chili, and the last at La Lagoona, a rancho near the town of Saric, Sonora.

The *Tellurides* from Melones appear to be three distinct species. One seems to be principally *Telluride of Silver*, with some *Telluride of Gold*—probably auriferous Hessite. The second is a combination of *Telluride of Silver and Lead*; the third, and most interesting of all, is *Telluride of Nickel*, which he calls *Melonite*. This is the first time that a combination of Tellurium and Nickel has been observed. It has a reddish-white color, almost exactly like that of Bismuth, and a granular and foliated structure. The three Tellurides are associated with native Gold, Quartz, Pyrites, Chalcopyrite, Calcite, etc., and it is almost impossible to obtain pure material for analysis.

From several of the mines in Humboldt County, Nevada, he has noticed a mineral with the aspect of Aikinite or Needle Ore, with the examination of which he is at present engaged.

July 16th.

MR. VAUX, Vice-President, in the Chair.

Sixteen members present.

July 23d.

DR. BRIDGES in the Chair.

Eighteen members present.

France; M. C. Recluz, Paris; Dr. Leon Vaillant, Paris; Baron de Castello de Paiva, Lisbon; Dr. G. Von dem Busch, Bremen; J. C. Cox, Sydney, N. S. Wales; Jules Mabille, Dinon, France; Luigi Benoit, Messina; J. Gonzales Hidalgo, Madrid; Abbe Joseph Stabile, Milan; M. Souverbie, Bordeaux.

Dr. Leidy remarked that the fine specimen of the cranial portion of a fossil ox skull, from St. Francisco, California, presented this evening by William M. Gabb, of the California Geological Survey, approached sufficiently near in size and form to the corresponding fragment of a skull from Big-bone-lick, Ken., referred to *Bison antiquus*, that it might be regarded as of the same species. Both probably belong to the female of *Bison latifrons*, as originally suggested in relation to the Big-bone-lick fragment. Prof. Rütimeyer, who has ably investigated the geological history of the bovine family, reverses the reference of the fossils to the sexes, and regards the American forms as of the same species as the European *Bison priscus*.

The measurements of the cranial specimen presented this evening are as follows:

Distance between tips of horn cores	3 feet.
Length of horn cores, following the lower curve	14½ in.
Circumference at root of horn cores	15 in.
Distance between roots of horn cores	14 in.
Length from inion to naso-frontal suture	13¾ in.
Depth of inion	8 in.
Breadth of inion	13 in.

Prof. E. D. Cope called attention to a collection of reptiles from Owen's Valley, California, made and presented by Dr. Geo. H. Horn. He observed that they confirmed the conclusions derived from the study of the insects, that its fauna was that of the Colorado Region, or the Sonoran district. Characteristic species were Spea bombifrons Cope, Coleonyx variegatus Baird, Rhinochilus lecontei Bd. Gird., Caudisona cerastes Hallowell, and a new Chilomeniscus Cope, which was called C. ephippicus, with the following characters:

Scales broad, in thirteen rows; tail about one-seventh total length. Rostral plate large, entirely separating internasals, not encroaching on prefrontals; nasal plate separating prefrontals and labials, in contact with preocular. Postoculars two, upper only in contact with occipital. Superciliaries very narrow, occipitals broad as long. Temporals $\frac{1}{1}$, large; labials above, seven, third and fourth in orbit, these with second, narrow erect; first longitudinal; fifth and sixth smaller than the others, seventh suddenly larger. Inferior labials eight, first pair in contact before pregeneials; postgeneials very small.

Total length five and one-half inches. Gastrosteges 113, separated from geneials by four rows gulars; anal 1—1; urosteges 28—28. Above reddish or yellowish, with twenty-one black cross-bars to vent, which are broader than interspaces, and do not quite reach gastrosteges; five nearly complete rings on tail. Belly white. From occipitals to anterior part frontal with the labials opposite this part (except their lower edges) black.

This species is somewhat similar to the C. cinctus Cope, from Sonora, but differs in many details, and in not being annulate.

He also stated that Scaphiopus holbrookii had appeared abundantly in a pond over a mile west of the falls of the Schuylkill. They were the first he had noticed in this neighborhood, though John Cassin had seen them previously in Delaware county.

The speaker also made some remarks respecting the origin of species, stating that the genera of tree frogs Hyla, Scytopis, Osteocephalus and Trachycephalus form a natural series, measured by the relative degree of ossification of the

irregular projections, perhaps long arms, would slide down laterally in converging depressions. By this process many horizontal currents would be produced on the surface.

Fourth source of motion. These irregular projections, perhaps great extended arms but little attached to the nebulæ, would be under the influence of neighboring nebulæ similar to tidal influence and stellar perturbation, especially while the nebulæ were still near to one another, though contracting rapidly to greater distances. Therefore the fall of these irregular prominences into the larger mass would be somewhat like the falling together of two independent nebulæ. They would not fall towards the centre of gravity of the principal mass, but more or less obliquely, and hence they would lead to rotatory motion.

From these four sources of motion many currents would flow *on the surface*, at least, of every nebula. In those cases where two large nebulæ fell into each other, the currents would pervade the entire mass. But even when the currents were superficial only, they could not stop; because, on account of the continued contraction of the nebula, they would flow in the direction of an inclined plane. With their horizontal motion they would have an inclined motion towards the centre, and gravity would hasten them downward. These currents would act and react on one another, and by well known mechanical principles they would all result in a single current, as we see by experiment in a basin or tunnel of water. This one current would be around the centre of gravity, and, for the same reason, it could not cease to flow. In consequence of the continued contraction of the nebula, every particle of the surface current is moving in the direction of an inclined plane, and gravity must give them the velocity due to inclined plane motion. If they be retarded by friction on the unrotating or slowly rotating interior, then this interior will be moved in the same direction, and gravity will carry it onward until the entire nebula rotates. As the nebula contracts from the extent of its original round form down to near its centre, *every particle must acquire a velocity equal to that of a fall from its original to its last extent*, excepting only the retardation due to friction. This is one of the most essential ideas in the nebular theory originated by myself, and demands a complete illustration.

Every body approaching toward the centre of the sun, whether directly or obliquely, must be hastened by the force of gravity. The celebrated Halley's comet, for instance, which requires about seventy-six years to go around its orbit, is beyond the distance of Neptune when it reaches its aphelion; then the moment it passes its aphelion, and begins its return toward the sun, it begins to be hastened on its course by gravity. So it continues to be hastened by that force every hour faster and faster, during thirty-eight years. Being free to move, and unobstructed, it runs in a conic section, and when it arrives at perihelion its velocity has become so great as to have a centrifugal stronger than its centripetal force. Therefore it shoots away from the sun again, but every hour in its departure its velocity is delayed by gravity. Thus the proposition is certain that when a body departs from the sun its velocity is retarded, and when it approaches the sun its velocity is accelerated, by gravity. Every particle in a current on the surface of a contracting nebula is moving obliquely, like a comet, towards the centre of the nebulous sun, and therefore they must all be hurried along by gravity.

Halley's comet, while descending from aphelion to perihelion, may be regarded as moving down a spiral inclined plane. Its ultimate velocity will be the same as if it had fallen to the sun through the height of the plane, plus its initial velocity at aphelion. That is, its ultimate velocity will be the same as if it had fallen from aphelion in a direct radial line until a distance from the sun equal to its periphelion, plus its initial velocity at aphelion. In the same manner a particle, while descending in its spiral current towards the centre of the nebulous sun, must at any point in its course have the same velocity, friction excepted, as if it had fallen in a direct radial line to that point, plus the

been the same as the present revolutions of their satellites; and the reason is pointed out why the smaller planets could have no satellites. By these and by many other coincidences the discovery was first made that GRAVITY IS THE FORCE WHICH IMPARTED ALL THEIR MOTIONS TO ALL THE STARS.

It is proper now to attend to three objections which, on account of the present state of astronomical science, naturally rise against this view of the necessity and velocity of nebular rotation.

The first objection is that this view "contravenes the principle of conservation of areas." The fallacy of this objection may be seen by a very simple arithmetical calculation. We will take Mercury, whose radius vector moves most rapidly, and at the rate of 110,000 per hour. Neptune is about eighty times farther from the sun. The original extent of our nebulous sun was halfway to the nearest fixed star; say 3,622 times farther than Neptune, and consequently, in round numbers, $3622 \times 80 = 290{,}000$ times farther than Mercury. The area described by the radius vector of Mercury in one hour equals that radius multiplied by half its distance per hour, say $1 \times 110{,}000 \div 2$. The area described by the radius vector of the original nebulous sun must have equalled that radius multiplied by half its distance per hour, say $290{,}000 \times x \div 2$. Both these areas must be equal. Now what must be the value of x that, when multiplied by 290,000, gives 110,000? Plainly $\frac{11}{29}$, or $\frac{1}{3}$ nearly; that is, the movement of the radius vector of the original nebulous sun, or, in other words, its primary rotation, was about one-third of a mile per hour. I will soon point out how this velocity was obtained.

The second objection is drawn from a misapplication of the principle that action and reaction are equal, and in opposite directions. By this principle, when an object falls to the earth, the earth falls proportionally to the object; when we walk forward in a straight line, we push the earth backward proportionally; when a car, by gravity, runs down an inclined plane, the earth as well as the plane moves proportionally in the opposite direction: that is, both upward and backward. Therefore it has been wrongly inferred that when a particle, or all the particles, on the rotating exterior of a contracting nebula move by gravity in the direction of an inclined plane toward the centre, then the interior should move proportionally just the contrary way. It has been wrongly inferred that these two opposite motions should counterbalance each other, that in fact there can be no such operation, that the whole idea is like "the old absurdity of a perpetual motion, or of a man trying to lift himself up by pulling at the straps of his boots."

But all such inferences show a misunderstanding of the case. We must learn to see the difference between moving in the direction of an inclined plane, and moving on an actual inclined plane. A comet or a planet approaching perihelion is moving in the direction of an inclined plane. With its forward motion in its orbit it has an inclined motion towards the sun, and its velocity is hastened by gravity in consequence of this inclination. Imagine a hundred comets all in the plane of the sun's equator, and equally distributed around the sun, and all approaching their perihelion. While all would be accelerated by gravity toward the sun, the sun would not be moved in any way towards them, because it would be equally acted on all around by the comets. Neither could there be any reaction to make the sun rotate in the opposite direction, because there is no actual inclined plane to cause a backward motion. The comets have the inclined plane motion without an inclined plane. In the same manner on the horizontal equatorial zone of a rotating and contracting nebula, all the particles move in the direction of an inclined plane spirally coiled many times around, and all are hastened by gravity according to the law of velocity on such a plane, but not one of them moves down an actual inclined plane. THEY ALL REPOSE ON A LEVEL OR HORIZONTAL SURFACE: therefore they do not move the interior backward while they move forward. If they were on an actual inclined plane they would create a coun-

The third and last objection is that gravity cannot cause nebular rotation, and that it cannot therefore be the force which imparted their present motions to the stars. We have already seen that if, on the surface of the nebula which formed our solar system, there had been a movement of rotation only about one-third or one-half a mile per hour, then gravity, acting by the law of conservation of areas, would have imparted the velocity of 110,000 miles per hour to Mercury. But how could this nebula have received a rotation of half a mile per hour? This question is easily answered by following the logical consequences of the nebular theory, aided by well known facts in astronomy. The fixed stars have velocities at least equal to the planets. When they were all in a nebulous condition, just broken up from the vast nebulous disk stretching all around within the Milky Way, they must have been irregular in form, quite near to one another, and *endowed with their present rapid velocities*. Then, by their mutual perturbations, they must have imparted motions to one anothers' irregular exteriors.

The power of perturbation between the fixed stars is much stronger than has been suspected by astronomers. In "The Origin of the Stars" I have shown that the sun's gravity on Alpha Centauri is now so powerful that that star must move more than 2,000 miles per day at right angles to its present direction from ourselves, to gain a centrifugal force sufficient to avoid falling into the sun. Estimating the masses of the stars from the amounts of their light and their distances, then the power of gravity from Alpha Centauri alone on our sun is so great that our sun must move more than 5300 miles per day to avoid falling into that star; and for the same reason our sun must fly with a velocity of more than 13,000 miles per day to avoid falling into Sirius. When these stars were in their nebulous conditions, expanded nearly to one another, irregular in shape, and moving past one another with their present astonishing velocities, their mutual power for moving currents on their irregular surfaces must have been very strong. Moreover, they must have had the same liability to fall into one another, and thus to produce rotation as the original stellar nebulæ.

We can also readily conceive how, in the very first formation of the several solar nebulæ, and flying along with inconceivable rapidity, their irregular projections may not have had precisely the same motions as the centre of gravity. From all these causes we can understand how, after the rounding process, a motion of half a mile per hour may have been given to the one resultant current on their surfaces.

But whence the proper motions of the fixed stars? or rather, whence the proper motions of the nebulæ from which the fixed stars were formed? The nebular theory gives the same cause for the forms and the motions of the stellar systems as of our solar system. That theory points to a great original nebula, whose rotations by the force of gravity formed and moved the ring of the Milky Way, and its interior disk, and its scattered exterior clusters. Gravity, in causing this rotation and the proper motions of the fixed stars, must have acted by the law of conservation of areas; and now we must inquire how much motion, according to that law, was necessary on the surface of our original stellar nebula? If half a mile per hour was sufficient for our solar system, how much was necessary for our stellar system? On the supposition that the stellar motions are as rapid as the planetary, and that the force of gravity was equally strong in both, then the original surface motions of our solar and stellar nebulæ must have been to each other in some proportion inversely as the lengths of their radii. But as the length of the stellar radius was almost infinitely longer than that of the solar radius, so the original motion on the surface of the stellar nebula must have been almost infinitely slower than on the surface of the solar nebula; that is, almost infinitely slower than half a mile per hour!

But whence these very slow motions on the surfaces of the original stellar nebulæ? These I have already given in the four sources of motion in the beginning of this paper.

ter movement. But such is not the case. Each one, while approaching the centre, draws the entire mass up towards itself, as when a fly alights on the earth, but being equally distributed all around, they counteract one anothers' efforts in this regard, and produce no result. The reason why there is a backward reaction on a real inclined plane is simply because of the inclination of the surface. An object cannot repose quietly on such a surface. The forward motion of the object must give a backward push to the surface. But when there is no inclined surface, as on an equatorial zone, there can be nothing against which a backward push can be made by mere gravity.

In its approach toward perihelion a comet is upheld from falling in a straight line toward the sun by centrifugal force; that is, its plane is sustained by centrifugal force. In like manner, on the equatorial zone of a rotating and contracting nebula, a particle is upheld from falling straight toward the sun's centre, partly by centrifugal force and partly by atomic repulsion; that is, its plane is upheld partly by centrifugal force and partly by repulsion. But neither of these hinders the force of gravity from imparting every instant an increased velocity in the inclined plane direction. Both repulsion and centrifugal force are constantly yielding before the power of gravity, and allowing the comet or the particle to be accelerated. In this way inclined plane direction and increasing velocity are produced without an actual inclined plane, and hence one of the reactions of an inclined plane is wanting: namely, the backward reaction. The other reaction—the upward—is nullified by opposite particles on opposite sides of the nebula.

Atomic repulsion has two effects different from mere centrifugal force; it hinders the moving particle from following an elliptic orbit, and it causes retardation by friction. But the direction of its action is always in a radial line, always perpendicular to the nebular surface on which the particle quietly reposes; and it yields every instant like centrifugal force before the power of gravity, which continually brings the particle toward the centre. In the beginning of nebular rotation, and when that rotation is very slow, a particle on the exterior presses with nearly all its weight on the interior. It is then upheld very little by centrifugal force, and chiefly by repulsion. As it moves more rapidly it acquires greater centrifugal force, and presses less heavily on the interior. It becomes hourly less and less upheld by repulsion, and more and more by centrifugal force. At length it is held up entirely by centrifugal force, and presses no more on the interior. It is independent of repulsion; it circulates freely around the centre, without approaching it. The centripetal and the centrifugal forces are equal.

An important illustration may be made with a funnel to show that a fluid may move down the direction of an inclined plane without producing the backward reaction of such a plane. Suspend the funnel by a single small silk braid, having no twist. Pour in the water, and give a portion a horizontal motion. Give the funnel an equal impulse in the opposite direction. The water, as it runs through the funnel, will rotate, and evidently every particle of the water will run an inclined plane direction, but the plane must necessarily take the form of a coil. According to the principle of the backward reaction on an actual inclined plane, the natural expectation would be to see the funnel rotate in the direction contrary to that of the water. But this does not occur. On the other hand, the water, by friction, carries the funnel around in the same direction with itself. In like manner the exterior of a nebula must carry along the unrotating interior with its own motion. The reason is the same in both cases. There is no backward reaction, because in both cases the particles, as they move, REPOSE ON A HORIZONTAL SURFACE. They do not move down an actual inclined surface, and hence cannot react according to the law of an inclined plane surface. They have the law of velocity, but not the law of backward reaction. This absence of the backward, though not of the upward, reaction, may be regarded as a new dynamical principle. It has not before been detected in the funnel problem, nor in the nebular theory, nor in aught else that I am aware.

The third and last objection is that gravity cannot cause nebular rotation, and that it cannot therefore be the force which imparted their present motions to the stars. We have already seen that if, on the surface of the nebula which formed our solar system, there had been a movement of rotation only about one-third or one-half a mile per hour, then gravity, acting by the law of conservation of areas, would have imparted the velocity of 110,000 miles per hour to Mercury. But how could this nebula have received a rotation of half a mile per hour? This question is easily answered by following the logical consequences of the nebular theory, aided by well known facts in astronomy. The fixed stars have velocities at least equal to the planets. When they were all in a nebulous condition, just broken up from the vast nebulous disk stretching all around within the Milky Way, they must have been irregular in form, quite near to one another, and *endowed with their present rapid velocities.* Then, by their mutual perturbations, they must have imparted motions to one anothers' irregular exteriors.

The power of perturbation between the fixed stars is much stronger than has been suspected by astronomers. In "The Origin of the Stars" I have shown that the sun's gravity on Alpha Centauri is now so powerful that that star must move more than 2,000 miles per day at right angles to its present direction from ourselves, to gain a centrifugal force sufficient to avoid falling into the sun. Estimating the masses of the stars from the amounts of their light and their distances, then the power of gravity from Alpha Centauri alone on our sun is so great that our sun must move more than 5300 miles per day to avoid falling into that star; and for the same reason our sun must fly with a velocity of more than 13,000 miles per day to avoid falling into Sirius. When these stars were in their nebulous conditions, expanded nearly to one another, irregular in shape, and moving past one another with their present astonishing velocities, their mutual power for moving currents on their irregular surfaces must have been very strong. Moreover, they must have had the same liability to fall into one another, and thus to produce rotation as the original stellar nebulæ.

We can also readily conceive how, in the very first formation of the several solar nebulæ, and flying along with inconceivable rapidity, their irregular projections may not have had precisely the same motions as the centre of gravity. From all these causes we can understand how, after the rounding process, a motion of half a mile per hour may have been given to the one resultant current on their surfaces.

But whence the proper motions of the fixed stars? or rather, whence the proper motions of the nebulæ from which the fixed stars were formed? The nebular theory gives the same cause for the forms and the motions of the stellar systems as of our solar system. That theory points to a great original nebula, whose rotations by the force of gravity formed and moved the ring of the Milky Way, and its interior disk, and its scattered exterior clusters. Gravity, in causing this rotation and the proper motions of the fixed stars, must have acted by the law of conservation of areas; and now we must inquire how much motion, according to that law, was necessary on the surface of our original stellar nebula? If half a mile per hour was sufficient for our solar system, how much was necessary for our stellar system? On the supposition that the stellar motions are as rapid as the planetary, and that the force of gravity was equally strong in both, then the original surface motions of our solar and stellar nebulæ must have been to each other in some proportion inversely as the lengths of their radii. But as the length of the stellar radius was almost infinitely longer than that of the solar radius, so the original motion on the surface of the stellar nebula must have been almost infinitely slower than on the surface of the solar nebula; that is, almost infinitely slower than half a mile per hour!

But whence these very slow motions on the surfaces of the original stellar nebulæ? These I have already given in the four sources of motion in the beginning of this paper.

In our solar nebula the areas described by the radius vector diminished very slowly, on account of the very slight friction, which also retarded the velocities of the planets, as I have shown in Section 19th.

August 6th.

Mr. Cassin, Vice-President, in the Chair.

Nineteen members present.

Dr. H. C. Wood, Jr., called the attention of the Academy for a few minutes to some observations on the life history of some of our siphonaceous fresh water algæ.

He stated that the accounts of the method of the production of the zoospores of the ordinary *Achyla prolifera*, as given by Henfrey and Carpenter, differed very essentially. The former states that the zoospores do not directly appear in the filaments, but that in the original zoosporangium are formed only *daughter cells* by the aggregation of nitrogenous protoplasm, which daughter cells are incapable of spontaneous motion, are unprovided with cilia, and are emitted apparently by being, as it were, forced out by endosmotic pressure excited through the zoosporangium. After emission, according to Henfrey, they remain clustered at the end of the filament, and in a few hours each daughter cell gives origin to a single zoospore, which is formed from the whole of its protoplasmic contents. According to Carpenter, the zoospores are formed directly in the zoosporangium, are then furnished with cilia, and escape by means of their own motile power. Dr. Wood stated that his own observations on the plant entirely corroborate and coincide with the results arrived at by the lamented Henfrey, and that he had frequently seen the very delicate cellulose coats of the daughter cells still aggregated around the distal end of the zoosporangium after the escape of the zoospores from them. Dr. Wood further called the attention of the members to the existence of several algoid forms growing in the neighborhood of the city, which were closely allied to *Achlya prolifera*, but in some respects quite distinct from it. In one of these, which appears to be at least generically the same as the former species, the Doctor stated he had studied the formation of *resting* spores, which takes place in a way similar to that seen in other of the Siphonaceæ, such as the Vaucheria. At the distal end of a filament about to form resting spores a roundish bulb-like enlargement takes place, which soon is crowded with nitrogenous protoplasm derived from the main filament, from which it is in a little while shut off by a delicate membranous partition. About this time, just below such sporangium, there appears a process very similar to that seen in the Vaucheria, which process finally comes in contact with the sporangium, between which and itself a communication is soon established. The contents of the sporange now contract themselves into a globular ball, and develop into the resting spore.

If these views and observations hereafter should be confirmed, they would settle the doubt expressed by many authorities, whether the Achyla be not merely a submerged fungus, altered by this very submersion so as to resemble an algoid growth; for if species of the genus are found whose whole life history is similar to that of others of the Siphonaceæ, even to the formation of resting spores by a kind of conjugation, it seems indisputable that the organisms under consideration are perfect entities, not merely degraded forms of higher plants. Further, granting the facts stated, if one of the Siphonaceæ is a fungoid growth, surely all the others must be; and it does not seem probable that the Vaucheria, with its green endochrome, is a fungoid growth.

Dr. Leidy mentioned the recent appearance of the seventeen year locust in Montgomery, Wythe and other counties of Virginia.

two specimens, supposing them to be the young of some species of Catostomus or Moxostoma. The size of the scales shows that it does not pertain to any species known in this region, and I was, therefore, induced to examine the pharyngeal teeth and alimentary canal. I found, to my surprise, that they were both of the carnivorous type, showing the form and position of the mouth to be deceptive, though they are frequently coördinated parts. The genus and species appearing to have hitherto escaped observation.

PHENACOBIUS Cope. Pharyngeal teeth 4—4, uncinate raptatory, sharp edged; alimentary canal not longer than head and body; dorsal fin above the ventrals; scales normal, lateral line complete; mouth very small, inferior, maxillary arch projectile, covered by a thick fleshy lip, which is enlarged posteriorly and behind mandible; no barbels; mandible naked, included. Aspect of Catostomus. Name from φενάξ, deceptive, and βιος, life.

Phenacobius teretulus Cope, sp. nov.

Head stout, 4⅓ times in total length, exclusive of caudal fin, equal depth at dorsal fin; orbit 3·5 in length of former, its superior rim on frontal plane. Preorbital bone elongate parallelogrammic. Muzzle elongate, decurved obtuse, heavy. Canthus of mouth opposite middle of o. præorbitale; supra-opercular region rounded; isthmus wide; form moderate, caudal peduncle not attenuated. Scales with coarse concentric lines and radii; 6—43—5; thoracic region scaled. Pectoral fin not reaching ventrals, nor ventrals the anal. Dorsal narrow, elevated; caudal deeply forked; radii D. 1. 8; C. + 18 +; A. 7; V. 1. 8; P. 17. Total length of specimen 3 in. 6·5 l. Above pale olive yellow, the scales faintly edged with black; below silvery; end of muzzle and band on each side to orbit blackish; a leaden band on each side on middle line from behind ventrals to base of caudal, which is occasionally broken into spots.

The affinities of this fish appear to be to Ceratichthys; its habits and food are probably similar; as in that genus the natatory bladder is largely developed. Its habitat appears to be in the rapid parts of the river; I have not seen it in the tributary creeks, though I have examined them carefully. Several specimens procured.

A second species of this genus exists in the upper waters of the Holston River, Va., which is more elongate than the P. teretulus, has smaller scales, and a more vertical range of vision. The thick projectile lips are slightly tuberculous; the orifice of the mouth very small, and the inner edge of the narrow mandible a cartilaginous ridge. Its habit is to lie on the bottom in the main channels of the river, as the form of its mouth would indicate, while the digestive system indicates carnivorous diet. The species does not occur commonly in the smaller creeks. It may be characterized as follows, under the name:

Phenacobius uranops.

Isthmus very wide; teeth 4—4. Head subcylindric; muzzle broad, projecting; orbits oval, having some vertical range, 3·5 times in length head, equal frontal width. Head 4·75 in length to origin caudal, 5·66 to end of same. Depth of dorsal in same respectively 6·25 and 7·25 times. Lateral line straight; scales $\frac{7}{43}$, those on the line of and anterior to the ventrals minute; lower surface from ventrals forward, naked. Pectorals extending ⅔ way to ventrals. R. 15; ventrals to vent, R. 8; anal narrow, short, 7. Caudal deeply emarginate, its peduncle narrowed; R. 20; dorsal much larger than anal; I. 8; anterior margin longer than depth of body; equal pectorals.

	in.	lin.
Total length	3	7·5
Depth at occiput		4·5
" " dorsal		6·
" " caudal peduncle (least)		2·75

dark greenish olive-brown, washed on the upper part of the back with vinaceous; the lateral tail feathers are purplish-black, the outer two on each side marked with grayish-white at their ends; quills dark brown, tinged with purple, the inner margins for two-thirds their length from the base pale dull cinnamon; lining of wings and axillars deep cinnamon; a band on the hind neck, of bluish ash, connecting with the same color on the breast; the lower part and sides of the neck are of a paler bluish-ash; chin and throat white; the sides are dark olive-brown; upper part of abdomen of a pale vinaceous, the lower part nearly white, just tinged with the color of the upper part; feathers over the thighs filamentous, and of a grayish-white color, as are also those of the vent; under tail coverts brown, with their ends white; bill black; "irides yellow;" tarsi and toes fleshy yellow.

Length (fresh) 10¾ in.; wing 5¼; tail 3⅝; bill ⅝; tarsi 1 3-16ths.

The female does not differ materially from the male.

Habitat.—New Granada. Line of the Panama Railroad.

Remarks.—This species was referred to *L. verreauxi* by Mr. Cassin, in his "Catalogue of Birds from the Isthmus of Darien," and by myself in "Catalogue of Birds from New Granada," &c. Since then I received from Mr. McLeannan a specimen of another species, which I determined to be the true *L. verreauxi*, Bp.; on a recent visit to Boston I was able to verify it as being so, by comparison with that species in the Lafresnaye collection, now the property of the Boston Natural History Society, the liberal gift of the late Dr. Henry Bryant.

L. verreauxi is above of a lighter and more decided olive, the outer three tail feathers on each side end more largely in white, the under plumage is much lighter and very different in color, the neck and upper part of the breast being of a light vinaceous rose color, gradually merging into white on the abdomen; the under tail coverts are entirely white.

The two species are very different in appearance, that of *cassinii* being very dark, whereas the colors of *verreauxi* are comparatively light.

I have conferred the name of my friend Mr. John Cassin on this fine species.

In the Museum of the Smithsonian Institution are specimens from Costa Rica, as well as those from the Atrato in Lt. Michler's collection.

Mr. John Galbraith, in his notes sent with the collection made for me on the line of the Panama Railroad, states that it is "common, but shy."

August 20th.

The President, Dr. Hays, in the Chair.

Nineteen members present.

August 27th.

Mr. Vaux, Vice President, in the Chair.

Sixteen members present.

The following gentlemen were elected members:

Dr. J. K. Tyson, Dr. W. Pepper, Dr. Geo. Pepper, Dr. Horace Binney Hare and Elias D. Kennedy.

The following were elected correspondents:

Geo. J. Durham, Austin, Texas; John Henry Gurney, Norfolk, Eng.; Osbert Salvin, London; T. C. Jerdon, M. D., Madras, India; and Prof. J. Reinhardt, Copenhagen.

Prof. Cope communicated by letter the following description of a new genus of Cyprinoid fishes from Virginia:

Among the Cyprinidæ of the Kanawha River, at Eggleston's Springs, one appeared to be of sufficient interest to mention to the Academy. I took but

basi-sphenoid yet remains open, while it appears to be closed in the New York skull. The specimen is about the same size as the latter, its length being 10¼ inches. In addition to the two localities indicated, the remains of this most gigantic of all rodents, recent and extinct, have been found in New York, Ohio, South Carolina, Tennessee, Mississippi and Louisiana.

September 24th.

MR. CASSIN, Vice-President, in the Chair.

Sixteen members present.

Chas. H. Thomas, M. D., and A. G. Hincle, M. D., were elected members, and Rev. Alphonso Wood, Brooklyn, N. Y., was elected a correspondent.

On favorable report of the respective committees, the following were ordered to be published:

Additional Note on Dicious forms of VITIS VINIFERA, L.

BY THOMAS MEEHAN.

On page 42 of the Proceedings of the Academy, I offered a few observations tending to show that the idea of De Candolle (since adopted by others), that Dioicousism was a peculiar attribute of the American species of *Vitis* and Hermaphroditism of the European was an error, and one which, as it had been adopted as a fact to divide the genus, ought to be corrected; and further, I suggested that the seedless grapes of Europe (currants) were probably pistillate forms. This has produced two letters from Dr. George Engelman, of so much interest that, with his knowledge, I make the following extracts:

"It is a well known fact that *Vitis vinifera*, when running wild, as it occurs in different localities on the banks of the Rhine, becomes polygamous; and I have specimens of male plants in my herbarium. The berries are small, acerb, and dark bluish-black.

The same, I have learnt from Prof. Parlatore, of Florence, grows in the swampy region near Leghorn, and is as large a plant there as our largest *V. cordifolia* or *riparia*),—a hundred feet high, and (stem) six or eight inches in diameter—and is there yet called "Labrusca" by the natives,—the ancient name used also by Virgil and Pliny, showing the same plant to be wild (native or naturalized?) at their time. This is also said by Prof. Parlatore to be dioicous, or rather polygamous.

The number of seeds does not depend on the fertility of the plant, but on the size of the berry: thus our small berries, *V. cordifolia* (*riparia*), bear usually one or two seeds, rarely (if ever) more.

The question with me is whether the plant is ever properly dioicous? I have never found female plants. All that I could examine were either male or hermaphrodite, though the hermaphrodite may not be absolutely *perfect*,—that is, though the pollen is perfect, it may require the pollen of another (male or hermaphrodite) plant to fertilize it.

Has any one seen purely female plants?

Your hypothesis of the seedless currants I cannot share. If not impregnated, the fruit will come to nothing; but there are seedless varieties of different plants you know."

In another letter, in reply to some suggestions of mine, Dr. Engelman adds: "I was too hasty in saying that a non-fertilized fruit would not ripen. Those with a fleshy calyx (epigynous) often do, without producing seeds; but of grapes I would doubt it. And, *moreover*, I do not know—and would like botanists to look to it—whether *female* flowers are found in *Vitis*. I find only complete, or male plants,—have never seen a purely female. If no one has, will they look out next season?"

Coloration above light olive, with a metallic dorsal line visible only in life; below white. A lateral silver band well defined above only, where it is tinged with leaden. The latter becomes darker on the caudal peduncle. Muzzle and streak through eye and operculum, blackish. Lips yellowish.

From Holston River, near Saltville Va.

September 3d.

The President, DR. HAYS, in the Chair.

Twenty members present.

September 10th.

The President, DR. HAYS, in the Chair.

Twenty-five members present.

The following was presented for publication:

"Description of a new species of Owl of the Genus Scops." By D. G. Elliot.

Dr. Leidy exhibited the fossil skull of a Gopher (Geomys bursarius), from the loess or yellow marl deposits along the Missouri. The specimen was sent for examination by Dr. Hayden, from Plattemouth, Nebraska. The skull is partly embedded in a hard argillaceous substance and appears completely petrified. According to Dr. Hayden, in the same formation, teeth of Mastodon and Elephant were found.

Dr. Bridges on behalf of the publication commmittee, announced that Vol. 6, Part 2 of the Journal was ready for distribution.

September 17th.

MR. CASSIN, Vice-President, in the Chair.

Thirteen members present.

The following was presented for publication:

"A study of the Rhamphastidæ or Toucans." By John Cassin.

Dr. Leidy submitted, for examination, an antique hammer of native copper, found in the Bohemian mine, Michigan, loaned for the purpose by Mr. W. H. Boyer through Mr. W. L. Mactier. It is of rude construction, apparently not cast, but partially cut and partially beaten into shape, which is that of an oblong square with irregularly pitted surfaces. It is about $3\frac{5}{8}$ in. long, $1\frac{5}{8}$ broad, and $1\frac{1}{4}$ wide, and weighs 1 lb. 14 oz. It has an irregular square hole through the centre of the lesser thickness, about large enough to insert the end of the thumb. The sides of the hole are very irregular. The square ends of the hammer are nearly level, though slightly rounded from use.

Dr. Leidy also exhibited a skull of the *Castoroides Ohioensis*, which had been recently sent him for examination by Prof. A. H. Worthen, State Geologist, of Springfield, Illinois. The specimen was found in ploughing, near Charleston, Coles county, Illinois. It is nearly perfect, with the exception of the loss of the zygomata and incisor teeth, and is remarkably well preserved, considering the position in which it was found. The worn condition of the teeth apparently indicates an older individual than the skull from northern New York, described by Prof. Wyman, though the suture between the basi-occipital and

I am enabled to bring this bird to the notice of ornithologists: and in my large work on the Birds of North America, now publishing, I propose to give a life-size portrait of this species.

In bestowing on this owl the name which I trust it is ever destined to bear, I simply express the desire which I am sure is felt by all ornithologists, to render honor to him who, combining the intrepidity of the explorer with the enthusiasm of the naturalist, twice penetrated the forbidding, cheerless districts of the far north, in order to extend the knowledge of his favorite science; and who perished in his early manhood, in the full tide of his usefulness, on the banks of the Yukon.

Ornithology has met no greater loss, in these later days, than in the death of Robert Kennicott.

A Study of the RAMPHASTIDÆ.

BY JOHN CASSIN.

Having been frequently interested, as well as greatly perplexed with the singularly nearly allied forms in this group, and having recently undertaken to study and label the large collections of the Philadelphia Academy and of the Smithsonian Institution, my memoranda have been readily expanded into this memoir. The collection of the Smithsonian Institution is mainly from Mexico and Central America, and contains numerous specimens of species previously known only as exceedingly rare and valuable. The collection of the Philadelphia Academy is quite extensive, and comprehensive also, containing about five-sixths of all known species, nearly the whole of which were presented by its most munificent and judicious patrons, Dr. Thomas B. Wilson, and Edward Wilson, Esq.

In this group, species do certainly exist which are very nearly related to each other, but I am not without a suspicion that the number has been unnecessarily increased, and that several so-called species should be regarded as varieties only, and in a few instances I doubt whether even that distinction is clearly tenable or permanent. In all cases, however, I give the species as I find them described. The splendid Monograph of this group by Mr. Gould renders the study of these birds comparatively easy; and, in very nearly all species, the figures are of the very first class in accuracy and faithfulness of representation.

I. Genus RAMPHASTOS, Linnæus.

Genus Ramphastos, Linn., Syst. Nat. i. p. 103 (1758).
Ramphastos, Aldrovandus, Orn. i. p. 801 (1599).
Ramphestes, Gesner, Icon. Av. p. 130 (1560).

1. *Ramphastos.*

1. Ramphastos Toco, Müller.
Ramphastos Toco, Mull., Syst. Nat. Supp. p. 80 (1776).
Ramphastos Toco, Gm., Syst. Nat. i. p. 356 (1788).
Ramphastos magnirostris, Swains., Cab. Cy. ii. p. 299 (1837).
Ramphastos niveus, Less., Supp. Oeuv. Buff.
Ramphastos picatus, Linn., Syst. Nat. i. p. 103 (1758)?
LeVaill. Ois. Par. pl. 2. Buff. Pl. Enl. 82. Gould, Mon. Ramph. 1st ed. pl. 6, 2d ed. pl. 1.

This large and well known species is regarded as the type of the genus *Ramphastos* by all modern authors, but as a matter of after as well as antecedent consideration, and especially for strict constructionists (of which I am one), it is worth remembering that, although the genus was established by Linnæus (or his editor Jussieu) as early as the fourth edition of Syst. Nat., in 1744, this

Transverse band of black at the base of the bill narrow, and spot of black at the tip of upper mandible much smaller. Colors of plumage as in *R. Toco*.

Total length about 19 to 20 inches; wing 8¾, tail 6, bill (chord) 5 inches.

Hab.—Southern Brazil (Cabanis). Spec. in Mus. Acad. Philada.

The throat is pure white in this species, if such it is, and the transverse band at the base of the bill seems to be much narrower than in *R. Toco*. The general size is smaller, and the bill much shorter. Probably only to be distinguished from the female of *R. Toco* by the presence or absence of the yellow tinge of the white of the throat, always present in *R. Toco*, always absent in *R. albogularis*. The red edgings and tinge of the white throat are not reliable as a character, being frequently absent in *R. Toco*, but ought to be always so, according to Dr. Cabanis' description, in *R. albogularis*. I suspect that this bird is the young female of *R. Toco*, so far as I can judge from one specimen only in the Acad. Mus., without label, stating locality.

2. *Burhynchus*.

3. Ramphastos carinatus, Swainson.

Ramphastos carinatus, Swains. Zool. Ill. i. p. (1821).
Ramphastos Tucanus, Shaw, Gen. Zool. viii. p. 362 (1811, nec Linn.)
Ramphastos sulfuratus, Less., Tr. Orn. i. p. 173 (1831).
Ramphastos callorhynchus, Wagl., Syst. Av. (1827).
Ramphastos porcilorhynchus, Licht.
Ramphastos piscivorus, Linn., Syst. Nat. i. p. 151 (1766)?
Edwards, Birds, vii. pl. 329. Swains. Zool. Ill. i. pl. 45. Gould, Mon. Ramph. 1st ed. pl. 7, 2d ed. pl. 2. Edwards, Birds, ii. pl. 64?

This large and very handsome species is well known as a bird of Mexico, and in the United States specimens were first introduced in sufficient numbers to supply all museums by Mr. Rafael Montes D'Oca, who obtained them at Jalapa. It stood isolated, and especially characterized by the colors of the bill, until a near relative, *R. brevicarinatus*, was described by Mr. Gould in 1854, and in 1862 another near relative, *R. approximans*, was described by Dr. Cabanis. These species, or supposed species, are very nearly related to each other, and although I have before me no less than thirty-two specimens, certainly representing all three of them, from the Academy and Smithsonian collections, I acknowledge myself quite perplexed in attempting to distinguish satisfactorily between them. At present, I can regard *R. carinatus* and *R. approximans* as differing only in the *width* of the scarlet band on the lower edge of the yellow space on the throat, and *R. approximans* and *R. brevicarinatus* as differing only in size. There are, however, specimens before me which I cannot clearly refer to either of the three species, though very probably one or the other, and I find it quite impossible to ascertain different geographical districts of locality. In fact, so far as can be determined from specimens before me, evidently very carefully labelled, these species inhabit very nearly the same countries and districts.

Throat yellow. Lower edge of the yellow space of the throat with a *very narrow and frequently also wanting band of scarlet* separating it from the black of the under parts of the body. Bill green, tipped with red, and a large obovate spot of orange near the base of the upper mandible, and an orange line on the culmen. At base of bill a narrow transverse band of black.

Upper tail coverts white, under tail coverts scarlet. All other parts of the plumage black, with a strong tinge of reddish-brown on the top of the head and neck behind. Legs bluish-black.

Total length about 22 to 24 inches; wing 8½, tail 7, bill (chord) 5½ to 6 inches.

Hab.—Mexico (Jalapa, Mr. D'Oca. Mirador, Vera Cruz: Dr. C. Sartorius. Potrero, Cordova, Prof. J. Sumichrast. Vera Paz, Mr. O. Salvin, Colan, Guatemala: Mr. H. Hagues. Belize, Honduras: Mr. C. J. Woods). Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

The band of scarlet on the lower edge of the yellow space of the throat is very narrow in this species, and frequently not to be seen without examination, but in fourteen specimens now under examination, it is present, and can be

and the upper mandible dark red or reddish chestnut on its lower portion, (in *R. ambiguus* and *R. abbreviatus* this lower portion is black). Abundance of specimens in Smiths. Mus. from localities in Costa Rica, and also from Western New Granada in Capt. Michlers Atrato collection. In Acad. Mus. this species is labelled New Grenada and "Columbie."

7. RAMPHASTOS AMBIGUUS, Swainson.

Ramphastos ambiguus, Swains. Zool. Ill. iii. p. (1823).

Gould, Mon. Ramph. 2d ed. pl. 5, 1st ed pl. 8, lower fig. Swains. Zool. Ill. iii. pl. 168.

Resembling the preceding, *R. Tocard*, and with the colors of the upper mandible divided in the same manner, but with the lower portion of the upper mandible and the lower mandible black. Colors of plumage as in that species,—*R. Tocard*,—but size rather smaller.

Total length about 20 to 22 inches.

Hab.—Northern and western South America, Bogota, Peru (Mr. Gould.) Spec. in Mus. Acad. Philada. and Smiths. Mus. Washington.

Perhaps rather smaller than the preceding, *R. Tocard*, but much resembling it, and the two species have been constantly confounded. The present bird can always be identified by its black and yellow upper mandible (brick red or reddish chestnut and yellow in *R. Tocard*). Specimens in Acad. Mus. are from Bogota and there are very fine specimens also from Bogota in the magnificent collection presented to the Smithsonian Institution by the Hon. A. A. Burton, late Minister of the United States to New Grenada.

8. RAMPHASTOS ABBREVIATUS, Cabanis.

Ramphastos abbreviatus, Cab. Jour. Orn. 1862, p. 334.

Resembling *R. ambiguus*, but smaller, and with the red tinge (or "wash") on the head and neck behind, and on the black of the breast, much more distinct. Bill with the colors divided as in the two preceding species, upper portion of upper mandible yellow, lower portion and lower mandible black (as in *R. ambiguus*). Wide pectoral band of scarlet. Colors of plumage as in *R. Tocard* and *R. ambiguus*.

Total length about 18 inches; wing 8½, tail 6, bill 4½ inches.

Hab.—Venezuela, Caracas (Mus. Acad.), Porto Cabello (Dr. Cabanis). Spec. in Mus. Acad. Philada.

Our specimen in the Massena collections now in Mus. Acad. is undoubtedly this species, which, in my opinion, is entirely respectable. It is allied to the two preceding species, but is smaller and has the bill especially smaller and not so wide, in the lateral view. The red tinge on the head and breast is much stronger in this specimen, as stated by Dr. Cabanis in his description of this species as above cited.

3. *Tucanus.*

9. RAMPHASTOS TUCANUS, Linnaeus.

Ramphastos Tucanus, Linn. Syst. nat. i. p. 103, (1758).
Ramphastos monilis, Müll. Syst. Nat. Supp. p. 83, (1776).
Ramphastos erythrorhynchus, Gm. Syst. Nat. i. p. 355, (1788).
Ramphastos Le Vaillantii, Wagl. Syst. Av. (1827)?
Ramphastos subfuscatus, Less.
Ramphastos citreopygus, Gould, Mon. Ramph, 1st ed. pl. 2?

Edward's Birds v. pl. 238. Buff. Pl. Enl. 262. Le Vaill. Ois. Par. pl. 3. Gould. Mon. Ramph. 1st ed. pl. 3, 2d ed. pl. 6. Shaw, Nat. Misc. vi. pl. 183. Le Vaill. Ois Par. pl. 4? Gould, Mon. Ramph. 1st ed. pl. 2?

Throat white, faintly tinged with yellow. Bill crimson, culmen and wide transverse band at base yellow. Upper tail coverts yellow, under tail coverts scarlet, a wide pectoral band of scarlet. All other parts of plumage black. Legs bluish-brown.

Total length about 22 inches; wing 9 to 10, tail 6 to 6½, bill (chord) 6¾ to 7 inches.

Hab.—Northern South America, Guiana, Surinam, Northern Brazil. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

This species is undoubtedly the *R. Tucanus* of Linnaeus, as suggested by that great and philosophical naturalist, Mr. Vigors, in Zool. Jour. ii. p. 471. It is an entirely peculiar and in some respects isolated species, strongly characterized by its red bill. Le Vaillant's figure above cited, Ois. Par. pl. 4, is

traced in all of them. Specimens of this fine species are in the Smiths. Mus. from Mexico and Central America, as above given, and in Acad. Mus. from Mexico.

4. RAMPHASTOS APPROXIMANS, Cabanis.

Ramphastos approximans, Cab., Jour. Orn. 1862, p. 333.

Like the preceding, but with the scarlet band on the lower edge of the yellow space of the throat *conspicuous and much wider*. About the size of the preceding, bill large. Colors of bill and of plumage as in the preceding, *R. carinatus*. "Iris yellow" (Mr. J. Carmiol).

Total length about 21 to 24 inches. Female smaller; total length about 20 inches.

Hab.—Costa Rica, Dota, Grecia, Angostura, San Carlos (Mr. J. Carmiol), San Jose (Dr. A. von Frantzius), Nicaragua, San Juan (Mr. De Bareuil), New Grenada, Panama (Mr. J. McLeannan). Spec. in Mus. Smiths. Washington, and Mus. Acad. Philada.

About the size of the preceding, and with the bill fully as large. Only to be distinguished from that species,—*R. carinatus*,—by the wide and conspicuous scarlet band as above described. Thirteen specimens in the Smithsonian collections from Costa Rica, and one specimen from Panama, are clearly this species. Others in Acad. Mus., from San Juan de Nicaragua, are also certainly this species, and just as certainly correct in locality.

Only differing in size from the next succeeding, *R. brevicarinatus*, both having the wide pectoral band of scarlet. It is possible that the yellow of the throat in *R. brevicarinatus* is darker, or with a tinge of orange, but at present I could distinguish between the female of one and the male of the other, with difficulty, if at all!

5. RAMPHASTOS BREVICARINATUS, Gould.

Ramphastos brevicarinatus, Gould, Monog. Ramph. p. (2d ed. 1854).
Gould, Mon. Ramph. 2d ed. pl. 3.

Much resembling the immediately preceding *R. approximans*, and with the scarlet pectoral band wide and conspicuous, but much smaller, and with the bill shorter. Colors of bill and of plumage as in the two preceding, *R. carinatus* and *R. approximans* (but probably with the yellow of the throat of a darker shade than in either).

Total length about 16 to 17 inches; wing 7½, tail 6½, bill (chord) 4 inches.

Hab.—Costa Rica, Chiriqui (Dr. John Evans), "western side of Isthmus of Panama" (Mr. John Gould), "Mexique" (Massena Coll.) Spec. in Mus. Acad. Philadelphia.

In one very fine adult specimen of this speies the yellow of the throat is of a darker and richer shade, than in any specimen of either of the two preceding species. This specimen came in a very interesting collection presented to the Academy by Dr. John Evans, and collected by him at Chiriqui, Eastern Costa Rica, thereby confusing somewhat the idea of this species being of the western coast, exclusively. The type of Mr. Gould is also in Acad. Mus. but bears no label stating locality.

6. RAMPHASTOS TOCARD, Vieillot.

Ramphastos Tocard, Vieill. Nouv. Dict. xxxiv. p. 281, (1819).
Ramphastos engnathos, Wagl. Syst. Av. Add. (1827).
Ramphastos Swainsonii, Gould, Proc. Zool. Soc. London, 1853, p. 69.
Gould, Mon. Ramph. 2d ed. pl. 4, 1st ed. pl. 8, upper fig. LeVaill, Ois. Par. pl 9?

Colors of the upper mandible divided by a diagonal line from near the nostril to the edge, within the terminal one-third of its length. Upper portion yellow, lower portion dark reddish-chestnut, lower mandible dark reddish-chestnut, terminal one-third, black. Throat yellow, with a transverse band of white and another of scarlet on its lower edge.

Upper tail coverts white, lower tail coverts scarlet. All other parts of the plumage black; top of the head and neck behind tinged with reddish-brown or *maron*. Legs bluish-brown. Young. Upper mandible entirely greenish-yellow, mottled with black at base. Plumage as in adult.

Total length about 22 to 24 inches; wing 9¼, tail 6¼ to 7, bill (chord) 6¼ inches.

Hab.—Costa Rica, Angostura, San Carlos, Turrialba (Mr. J. Carmiol), New Grenada, Rio Nercua (Capt. N. Michler), "Columbie" (Mr. J. Verreaux). Spec. in Mus. Acad. Philada. and Mus. Smith. Washington.

This is the first of three species in which the colors of the upper mandible are separated by an oblong or diagonal line from near the nostril to the edge within its terminal one-third. In this species the bill is large and tumid

13. RAMPHASTOS CITREOLAEMUS. Gould.

Ramphastos citreolaemus, Gould, Proc. Zool. Soc. London, 1843, p. 147. Gould, Mon. Ramph. 2d ed. pl. 9. Gray, Gen B. ii. pl. 109.

Like the preceding and *R. Cuvieri*, but smaller, and with the pale yellow space on the throat nearly encircled with white. Bill black, with the culmen and a wide transverse band at base yellowish-green. The yellow on the neck in front clearer defined, and of a lighter shade than in either of the preceding species. Upper tail coverts pale yellow.

A wide pectoral band of scarlet, under tail coverts scarlet, all other parts of the plumage black. Scarlet of the under tail coverts extending upwards, and appearing somewhat in the upper tail coverts which are yellow. Legs bluish-black.

Total length about 21 inches; wing $8\frac{1}{2}$, tail $7\frac{1}{2}$, bill $3\frac{1}{2}$ inches.

Hab.—Northern South America, Bogota. Spec. in Mus. Acad. Philada.

Smaller than *R. Cuvieri*, but about the size of *R. culminatus*. Differs from the former in having the white space on the throat strongly tinged with yellow in its lower part only, and in having the upper tail coverts pale yellow. (In both *R. Cuvieri* and *R. culminatus* the upper tail coverts are orange). In *R. culminatus* the throat is pure white and scarlet, pectoral band narrow; in this species, *R. citreolaemus*, the white space is strongly tinged with yellow in its lower part and the pectoral band, wide, and of a different shade of scarlet.

The only specimens that I have seen of this species are Mr. Gould's types in the Acad. Mus., both of which were received in the Massena collection, presented to the Academy by Dr. Thomas B. Wilson.

14. RAMPHASTOS OSCULANS, Gould.

Ramphastos osculans, Gould, Proc. Zool. Soc. London, 1835, p. 156. Gould Mon. Ramph. 1st ed. pl. 5, 2d ed. pl. 10.

Very much like the preceding, *R. citreolaemus*, but with the upper tail coverts orange, and the neck in front orange. Bill black, culmen and wide transverse band at base yellowish-green. Plumage of other parts as in *R. citreolaemus*.

Total length about 19 inches.

Hab.—Northern South America, Guiana, Rio Negro (Mr. Gould).

This species I have not seen. Judging from Mr. Gould's description and from his superb figure, it differs from *R. citreolaemus* sufficiently, in the orange of the neck in front, and upper tail coverts as above, (both of which are yellow in *R. citreolaemus*).

4. *Ramphodryas.*

15. RAMPHASTOS ARIEL, Vigors.

Ramphastos Ariel, Vig., Zool. Jour. ii. p. 466, (1826).
Ramphastos Temminckii, Wagl., Syst. Av. Ramph. No. 10, (1827).
Ramphastos Tucanus, Wagl., Syst. Av. Ramph. No. 11, (1827), nec. Linn.?
Ramphastos erythrosoma, Wagl., Syst. Av. Ramph. No. 9, (1827)?
Ramphastos maximus, Cuv Reg. An. i. p. 431, (1817)?
Ramphastos flavicollis, Müll. Syst. Nat. Supp. p. 83, (1776)?
Gould, Mon. Ramph. 1st ed. pl. 10, 2d ed. pl. 12. Buff. Pl. Enl. 307? Le Vaill Ois. Par. pl. 6? Zool. Jour. ii. pl. 15.

Male. Bill black, with a wide transverse band of yellow at base, flattened somewhat, and with a wide groove near the culmen. Upper tail coverts scarlet. Throat orange, with a narrow band of pale yellow on its lower edge, which is succeeded by a wide band of scarlet on the breast. Under tail coverts scarlet. All other parts of the plumage black. Legs bluish-black. Iris at in some specimens reddish-orange.

Length variable, about 18 to 21 inches; wing 7 to 8, tail $6\frac{1}{2}$ to 8, bill (chord) 4 to 5 inches.

Hab.—North-eastern and eastern South America, Bahia, St. Catherines, San Paulo. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

This is the first of several species in which the upper tail coverts are scarlet. In this species the bill is uniformly clear black, including the culmen, and having only a transverse band, at base, of yellowish white. So far as can be determined from dried specimens the bill in this species is more flattened than usual in this group and with a wide but shallow groove, leaving the culmen very distinct.

The specimens before me from various localities and all of which I regard

very probably, this bird, though the pectoral band is given as yellow instead of scarlet. On this figure *R. Le Vaillantii* is founded as above.

In his first edition Monog Ramph. Mr. Gould describes and figures a bird to which he gives the name *R. citreopygus*, as above. In his second edition, he states that the specimen figured "is made up of the head of *R. vitellinus* and body of *R. erythrorhynchus*."

10. RAMPHASTOS INCA, Gould.

Ramphastos Inca, Gould, Proc. Zool. Soc. London, 1846, p. 68.
Gould Mon. Ramph. 2d ed. pl. 7.

Resembling the preceding, but with the bill black, culmen yellow, and a large somewhat triangular spot of red on each side of the culmen near the base of the bill. A wide transverse band at the base of the bill yellow, with a narrow band of scarlet at its anterior edge. Upper tail coverts rich orange, under tail coverts scarlet, all other parts of plumage black. Total length about 20 inches.

Hab.—Western South America, Bolivia (Mr. Gould.)

This species is unknown to me, though one specimen in Acad. Mus. seems to approach it, but the upper tail coverts are not so richly colored as in Mr. Gould's figure, though more decidedly orange than in *R. Tucanus*, and the bill being dry and faded long since, does not show the peculiar markings of the present bird. The specimen is rather shorter, and the tail especially so, and the bill larger than in the specimens of that species now under examination. The specimen alluded to is No. 650, and is labelled only "Bresil."

11. RAMPHASTOS CUVIERI, Wagler.

Ramphastos Cuvieri, Wagl. Syst. Av. p. (1827).
Ramphastos Forsterorum, Wagl. Syst. Av. p. (1827) ?
Gould Mon. Ramph. 1st ed. pl. 2, 2d ed. pl. 8. Le Vaill. Ois. Par. pl. 5?

Bill black. Resembling both of the preceding in colors of plumage, especially *R. Tucanus*, but with the bill black, culmen and wide transverse band at base of bill yellow. Upper tail coverts orange, under tail coverts scarlet, throat white, faintly tinged with yellow, a wide pectoral band of scarlet; all other parts of the plumage black.

Total length about 22 to 23 inches; wing 9½, tail 6½, bill (chord) 6¼ to 7 inches.

Hab.—Northern South America, Rio Amazons. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

Distinguished from *R. Tucanus* by its black bill and orange upper tail coverts and seems to be rather larger. From *R Inca* this species differs in not having the large spots in the upper mandible nor the scarlet transverse line at the base of the bill. Specimens in Acad. Mus. labelled "Upper Amazon" and other very fine specimens in the Smiths. Mus. from Lieut. Herndon's collections on that river.

The figure in Le Vaill. Ois. Par. pl. 5, may be intended to represent this species, but the throat is orange and the upper tail coverts scarlet. Stated to be from Peru. *R. Forsterorum*, Wagler as above, is founded on this figure.

12. RAMPHASTOS CULMINATUS, Gould.

Ramphastos culminatus, Gould, Proc. Zool. Soc. London, 1833, p. 70.
Gould, Mon. Ramph. 1st ed. pl. i. 2d ed. pl. xi.

Bill black. Resembling *R. Cuvierii*, but smaller, with the bill more compressed, and with the throat pure white. Bill black, with the culmen and wide transverse band at base greenish-yellow. Upper tail coverts orange, under tail coverts scarlet, pectoral band narrower and darker red than in *R. Cuvierii*. All other parts of plumage black. Legs bluish-black.

Total length 19 to 20 inches; wing 8 to 8¼, tail 6¼ to 7, bill 5 to 5½ inches.

Hab.—Western South America, Peru? (Hon. J. R. Clay), Upper Amazon (Mr. Gould). Spec. in Mus. Acad. Philada.

Very much like *R. Cuvieri* but got up on a smaller scale and clearly distinct. The pure white throat is a peculiar and immediately available character, and the pectoral band is narrow and dark red, quite distinct in shade from that of *R. Cuvieri*. It is an entirely respectable species.

The only specimens of this species that I have seen, are in the fine collection made by the Hon. John Randolph Clay, while minister of the United States to Peru, and are very probably from that country.

II. Genus PTEROGLOSSUS, Illiger.

Genus Pteroglossus, Ill. Prodr. p. 202 (1811).

1. *Pteroglossus.*

1. PTEROGLOSSUS ARACARI, (Linnæus).

Ramphastos Aracari, Linn. Syst. Nat. i. p. 104, (1758).

Ramphastos atricollis, Müll. Syst. Nat. Supp. p. 83, (1776).

Gould, Monog. Ramph. 1st ed. pl. 12, 2d ed. pl. 15. Buff. Pl. Enl. 166. Shaw, Nat. Misc. pl. 198. Le Vaill. Ois. Par. pl. 10, 12.

Adult ♂. With one wide, well defined band of scarlet on the abdomen. Entire head and neck glossy black; back, wings and tail fine dark green; under parts of body greenish-yellow (except the wide band of scarlet across the abdomen). Tibiæ olive-green, mixed with reddish; rump scarlet. Bill with the upper mandible yellowish-white, (or straw color) and a *wide* longitudinal band of black on the culmen; under mandible black; at the base of both mandibles, and completely enclosing the bill, a raised band of straw-yellow. Legs greenish. Frequently an obscure spot of dark chestnut on the ear, and usually an obscure and imperfect narrow band of scarlet between the black and yellow on the neck or breast.

Total length about 18 or 19 inches; wing 6, tail 7½, bill (chord) 4½ to 5 inches.

Hab.—North-eastern South America, Guiana, Northern Brazil. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

This might erroneously be supposed to be a common and well known species, but between *P. formosus* on one side, which is larger, and *P. Wiedii* on the other, which is smaller, but both otherwise very similar, it is not entirely easy to fix its identity, nor to ascertain which of the three was originally described. At present I rely on the plate and description of Mr. Gould.

The *wide* band or stripe on the culmen is the only remaining hope for this species, this stripe being narrow (or not so wide!) in both of its aspiring relatives, now about to be brought forward. It does appear, though, that the *tibiæ* are more mixed with red than in either *P. formosus* or *P. Wiedii*, and other small points of difference can be developed by the diligent and patient student.

2. PTEROGLOSSUS WIEDII, Sturm.

Pteroglossus Wiedii, Sturm, ed. Gould's Ramphast. p.

Sturm, ed. Gould's Monog. pl. Gould. Monog. 2d ed. pl. 16.

Much resembling the preceding, but smaller, with the bill shorter and less curved, and the longitudinal stripe on the culmen much narrower. Tibiæ more clearly dark green; breast with little or no mixture of scarlet.

Total length about 17 or 18 inches; wing 5½ to 6¾, tail 6½ to 7, bill (chord) 4 to 4½ inches.

Young male. Throat and sides of the neck with a decided tinge of dark chestnut; other parts as in adult.

Hab.—Central and eastern South America, Bahia, Rio de Janeiro. Spec. in Mus. Acad. Philada.

Smaller than the preceding, with the longitudinal stripe on the culmen narrow. Inhabits more southern districts of South America.

3. PTEROGLOSSUS FORMOSUS, Cabanis.

Petroglossus formosus, Cab. Jour. Orn. 1862, p. 332.

Much resembling both of the preceding, but larger than either. Stripe on the culmen narrow, as in *P. Wiedii*. Yellow plumage of the breast mixed with red, as in *P. Aracari*. Tibiæ green, as in *P. Wiedii*. Bill long, strongly curved at the end (perhaps more slender than in either of the preceding).

Total length about 19 or 20 inches; bill (chord) 5½ inches.

Hab.—Northern South America, "Venezuela" (Cabanis). Spec. in Mus. Acad. Philada.

Young. This specimen: Bill thick, much shorter than in adult, cutting edge of upper mandible entire, smooth; not serrated as in adults. Entire head dull brown or snuff color, darker on the crown; upper part of back, wings and tail dark green; under parts of body dull and pale greenish-yellow; wide band across the abdomen dull yellowish-red. Bill of a uniform greenish-yellow, darker on the under mandible, lighter at the tip. Yellow of the breast mixed with pale reddish.

Total length about 14 inches.

This is a large species like *P. Aracari*, but with the longitudinal stripe on the culmen narrow as in *P. Wiedii*. One specimen in the Acad. Mus. is this bird. It is labelled "Demarara" in a hand writing that I do not recognise.

as one species, would make about three, with some stretch of propriety. One specimen from St. Catherines, Brazil, is larger than all others: total length 21 inches, wing 8½, tail 7½ inches, but the bill is shorter than others; length (chord) 4¾ inches. Two other specimens labelled only "Bresil," have the throat dark reddish orange, (or orange red) much darker red than usual in specimens from Bahia. The largest seems to be that figured and described by Mr. Gould.

It is not to be concluded hastily that the species proposed by Wagler as above are all to go for nothing. Two of them, *R. Tucanus* and *R. erythrosoma*, seem to be founded on figures, and, if said figures are correct, they are valid species. These figures may represent *R. Ariel* with some exaggerations and oversights. Wagler's species are:

1. *Ramphastos Temminckii*, which is *R. Ariel* as above given.

2. *Ramphastos erythrosoma*, founded on Le Vaill. pl. 6, which is much like *R. Ariel*, but has the under parts almost entirely scarlet.

3. *Ramphastos Tucanus*, (Wagl. nec. Linn.) *R. flavicollis*, Müller, founded on Pl. Enl. 307, in which the upper tail coverts are orange, (not scarlet, as in *R. Ariel*) and the pectoral band *narrow* (it is very wide in *R. Ariel*.)

The following are varieties in the collections now under examination:

R. Ariel, a. Throat pale orange. Eastern Brazil, Bahia.
b. Throat deep reddish orange, bill longer. Northern, Amazon River.
c. Large, bill shorter, throat pale orange. Southern, St. Catherines, Rio de Janeiro.

16. RAMPHASTOS VITELLINUS, Temminck.

Ramphastos vitellinus, Temm., Man. D'Orn. i. p. 76, (1820.)

Gould, Mon. Ramph. 1st ed. pl. 9, 2d ed. pl. 13. Le Vaill. Ois. Par. pl. 7. Swains., Zool. Ill. i. pl. 56.

Bill black, upper tail coverts scarlet, large space on the throat orange in the middle and lower part, fading into pure white on its edges, throat, and sides of the neck. Wide pectoral band and under tail coverts scarlet. All other parts of the plumage black, legs bluish-black. Bill black, with a transverse band of pale blue at base, flattened and grooved near the culmen.

Total length about 19 to 20 inches; wing 7½ to 8, tail 6½ to 7, bill 4½ to 5 inches.

Hab.—Northern South America, Guiana, Cayenne, Northern Brazil. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

In all American collections, and not difficult to distinguish from any other species. The bill is entirely black, including the culmen, but having a wide transverse band of pale blue at base.

5. *Tucaius.*

17. RAMPHASTOS DICOLORUS, Linnaeus.

Ramphastos dicolorus, Linn. Syst. Nat. i. p. 152, (1766).
Ramphastos chlororhynchus, Temm. Man. d'Orn, i. p. 76, (1820).
Ramphastos pectoralis, Shaw, Gen. Zool. viii. p. 365, (1811).
Ramphastos Tucai, Licht. Verz. p. 7, (1823).

Buff. Pl. Enl. 269. Le Vaill. Ois. Par. pl. 8. Swains. Zool. Ill. ii. pl. 108. Jard. & Selby, Ill. i. pl. 29. Gould Mon. Ramph. 1st ed. pl. xi. 2d ed. xiv.

Bill green, with a transverse band of black at base. Entire under parts of body scarlet, with a transverse band of black on the abdomen; tibiæ black. Upper and under tail coverts scarlet. Large space on the throat, orange in the middle and fading into pale yellow on its edges, throat, and sides of the neck. All other parts of the plumage black. Legs brownish-black. Bill flattened and grooved near the culmen.

Total length about 17 to 20 inches; wing 7½ to 8, tail 6½ to 7, bill 3¾ to 4 inches.

Hab.—Central and eastern South America, Brazil, St. Catherines, Rio de Janeiro, San Paulo, Paraguay. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

This abundant and handsome species differs from all others of this genus, in having the bill green and the under parts almost entirely scarlet, the *tibiæ* and a narrow belt on the abdomen being black. It is in all American collections.

pluricinctus). Yellow of the under parts much mixed with scarlet. Otherwise much resembling *P. pluricinctus*.

Total length about 18 to 20 inches; wing 6 to 6¼, tail 7 inches. Female rather smaller.

Hab.—New Grenada, Rio Truando, a tributary of the Rio Atrato. Spec. in Mus. Smiths. Washington, and Mus. Acad. Philada.

Six specimens in Capt. Michler's collection, from the Rio Atrato and its tributaries, are undoubtedly this species, and as distinct as customary in this group from *P. erythropygius*. It is probably not smaller than that species.

8. PTEROGLOSSUS TORQUATUS, (Gmelin).

Ramphastos torquatus, Gen. Syst. Nat. i. p. 354, (1788).
Pteroglossus ambiguus, Less. Traite. d'Orn. i. p. 178, (1831).
Pteroglossus regalis, Licht.
Ramphastos discolor, Müll. Syst. Nat. Supp. p. 83, (1776).
Tucana mexicana torquata, Briss. Orn. iv. p. 421.
Gould, Monog. Ramph. 1st ed. pl. 14, 2d ed. pl. 20.

Generally resembling the preceding, but rather smaller, and distinguished by a band of chestnut on the neck behind. Upper band (on the breast) nearly obsolete, or represented only by a large black spot on the breast. Yellow of the under parts much mixed with scarlet.

Total length about 17 inches.

Young ♂. Bill with the cutting edges plain, without serratures, and entirely light brown, yellowish on the edges of the upper mandible. Adolescent. Under mandible nearly black; upper mandible orange at base; plumage nearly as in adult, but dull, and abdominal band narrow and imperfect.

Hab.—Central America, Northern South America, Mexico? Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

Numerous specimens in Smiths. Mus. from Angostura and Turrialba, Costa Rica, and from Coban and Choctun, Central Guatemala, and in the Acad. Mus. from Chiriqui, Costa Rica, and Veragua, New Grenada, and several specimens labelled "Mexique." One specimen in Acad. Mus. is labelled "Guayaquil," Ecuador.

This handsome Toucan, was until recently, a highly respectable species, eminently distinguished by its chestnut collar worn on the neck behind: but that character is no longer peculiar, two other species having appeared setting up the same badge of distinction with some propriety. We will proceed to examine their claims without unnecessary delay.

9. PTEROGLOSSUS NUCHALIS, Cabanis.

Pteroglossus nuchalis, Cabanis, Jour. Orn. 1862, p. 332.

Very similar to the preceding,—*P. torquatus*,—and with a chestnut collar on the neck behind. Bill larger, longer, and curved at the end at a wider or more obtuse angle. Black spot on the breast smaller, and yellow of the under parts more mixed with scarlet than in *P. torquatus*.

Total length about 18 inches.

Hab.—"Porto Cabello" (Cabanis). Spec. in Mus. Acad. Philada.

This species, if so, can be recognized mainly by its larger and longer bill, gradually curved and not so decidedly nor abruptly hooked at the end as in *P. torquatus*. The under parts in the specimen before me are more mixed or spotted with scarlet than in either of ten specimens of that species (*P. torquatus*) in the Acad. and Smiths. collections, and at the termination of the black on the neck in front there is a band of bright scarlet, narrower, but more complete than in either of them. It may be only a full plumaged or older specimen of that species!

The only specimen in Acad. Mus. is labelled "*Pteroglossus regalis*, ♂ ? Mexique," in a handwriting that I do not recognise.

10. PTEROGLOSSUS FRANTZII. Cabanis.

Pteroglossus Frantzii. Cab. Sitz. Bericht Naturf. Berlin, 1861. Jour. Orn. 1862, p. 332.

Like *P. torquatus* and *P. nuchalis*, and about the same size or rather larger, but with the abdominal band very wide and nearly pure scarlet. Upper mandible yellow, except the usual stripe on the culmen, which is black, and a space of dark greenish at base (yellow at the tip, which is black in *P. torquatus* and *P. nuchalis*). Chestnut-colored collar on the neck

4. PTEROGLOSSUS PLURICINCTUS, Gould.

Peteroglossus pluricintcus, Gould Proc. Zool. Soc. London, 1835, p. 157. Gould, Monogr. Ramph. 1st ed. pl. 15, 2d ed. pl. 17.

About the size of *P. Aracari*, or rather larger. With *two* bands on the under parts of the body; one is black across the breast, the other is mixed black and scarlet across the abdomen. Head and neck black, with a rich bluish lustre; back, wings and tail dark green; rump scarlet. Under parts of body (except the bands) fine greenish-yellow or straw-color, much mixed with scarlet; lower band almost entirely scarlet and expanded on the sides; tibiæ greenish-chestnut.

Upper mandible rich yellow, nearly orange on the basal half of the bill, a wide stripe of brownish-black on the culmen, under mandible brownish-black, bill enclosed at base by a raised line of yellow. Female and young male with the ears fine chestnut.

Total length about 18 to 20 inches; wing 6 to 6½, tail 7, bill (chord, from corner of mouth direct to point) 4 to 4½ inches. "Iris yellow" (Lieut. Herndon, in Smiths. Mus.)

Hab.—Northern South America, "Rio Negro," "Rio Orenoque" (Acad. Mus.), "Petas, Amazon River" (Lieut. Herndon). Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

A beautiful and strongly characterized species, easily distinguished from either of the preceding by its *two* bands on the under parts. It is, however, singularly afflicted with relatives (as follows immediately) and to avoid discouraging entanglements, it is necessary to remember that in this species and the next succeeding only, *P. pœcilosternus*, the upper band (on the breast) is complete and well defined and black. In all others the upper band is imperfect or rudimentary, or not at all.

5. PTEROGLOSSUS PŒCILOSTERNUS, Gould.

Pteroglossus pœcilosternus, Gould, Proc. Zool. Soc. London, 1843, p. 147. Gould, Monogr. Ramph. 2d ed. pl. 18. Le Vaill. Ois. Parad. pl. 11.

Only differing from the preceding in having the lower band (on the abdomen) nearly fine scarlet, or but slightly mixed with black, and the yellow of the under parts less mixed with scarlet.

Total length 18 to 20 inches.

Hab.—Western South America, Peru. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

This species, if such it is, inhabits a more western range of locality than the next preceding, *P. pluricinctus*, which it exceedingly resembles. One specimen in Smiths. Mus. is in Lieut Herndon's collection from the Western tributaries of the Rio Amazon. One other in the Acad. Mus. bears Mr. Gould's label, but without locality.

6. PTEROGLOSSUS ERYTHROPYGIUS, Gould.

Pteroglossus erythropygius, Gould, Proc. Zool. Soc. London, 1843, p. 15. Voy. Sulphur, Birds pl. 28. Gould, Monogr. Ramph. 2d ed. pl. 21 (lower figure).

Under mandible yellow, tipped with black (the under mandible is black in all others of this connection). Upper mandible with a wide longitudinal band parallel with its cutting edge (which the preceding two species have not). Otherwise much resembling *P. pluricinctus* and *pœcilosternus*.

Total length 18 inches (Gould).

Hab.—Realejo, Western Nicaragua (Mr. Gould).

This species I have not seen. It appears to be much like the various allies of *P. pluricinctus*, but has the under mandible yellow in its basal two thirds. Nearly allied also to the next succeeding (*P. sanguineus*) but that species has the under mandible black.

7. PTEROGLOSSUS SANGUINEUS, Gould.

Pteroglossus sanguineus, Gould, Monogr. Ramph. 2d ed. p. (in text of *P. erythropygius*), (1854).

Pteroglossus erythropygius, Cassin, Cat. Michler's collection, Proc. Acad. Philada., 1860, p. 136.

Gould, Monogr. Ramph. 2d ed. pl. 21 (upper figure).

Resembling the immediately preceding, but with the under mandible black (which is yellow in that species—*P. erythropygius*). A longitudinal band of black near the cutting edge of the upper mandible, as in the preceding (but not in any other of the allies of *P.*

pluricinctus). Yellow of the under parts much mixed with scarlet. Otherwise much resembling *P. pluricinctus*.

Total length about 18 to 20 inches; wing 6 to 6¼, tail 7 inches. Female rather smaller.

Hab.—New Grenada, Rio Truando, a tributary of the Rio Atrato. Spec. in Mus. Smiths. Washington, and Mus. Acad. Philada.

Six specimens in Capt. Michler's collection, from the Rio Atrato and its tributaries, are undoubtedly this species, and as distinct as customary in this group from *P. erythropygius*. It is probably not smaller than that species.

8. PTEROGLOSSUS TORQUATUS, (Gmelin).

Ramphastos torquatus, Gen. Syst. Nat. i. p. 354, (1788).
Pteroglossus ambiguus, Less. Traite. d'Orn. i. p. 178, (1831).
Pteroglossus regalis, Licht.
Ramphastos discolor, Müll. Syst. Nat. Supp. p. 83, (1776).
Tucana mexicana torquata, Briss. Orn. iv. p. 421.
Gould, Monog. Ramph. 1st ed. pl. 14, 2d ed. pl. 20.

Generally resembling the preceding, but rather smaller, and distinguished by a band of chestnut on the neck behind. Upper band (on the breast) nearly obsolete, or represented only by a large black spot on the breast. Yellow of the under parts much mixed with scarlet.

Total length about 17 inches.

Young ♂. Bill with the cutting edges plain, without serratures, and entirely light brown, yellowish on the edges of the upper mandible. Adolescent. Under mandible nearly black; upper mandible orange at base; plumage nearly as in adult, but dull, and abdominal band narrow and imperfect.

Hab.—Central America, Northern South America, Mexico? Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

Numerous specimens in Smiths. Mus. from Angostura and Turrialba, Costa Rica, and from Coban and Choctun, Central Guatemala, and in the Acad. Mus. from Chiriqui, Costa Rica, and Veragua, New Grenada, and several specimens labelled "Mexique." One specimen in Acad. Mus. is labelled "Guayaquil," Ecuador.

This handsome Toucan, was until recently, a highly respectable species, eminently distinguished by its chestnut collar worn on the neck behind; but that character is no longer peculiar, two other species having appeared setting up the same badge of distinction with some propriety. We will proceed to examine their claims without unnecessary delay.

9. PTEROGLOSSUS NUCHALIS, Cabanis.

Pteroglossus nuchalis, Cabanis, Jour. Orn. 1862, p. 332.

Very similar to the preceding,—*P. torquatus*,—and with a chestnut collar on the neck behind. Bill larger, longer, and curved at the end at a wider or more obtuse angle. Black spot on the breast smaller, and yellow of the under parts more mixed with scarlet than in *P. torquatus*.

Total length about 18 inches.

Hab.—"Porto Cabello" (Cabanis). Spec. in Mus. Acad. Philada.

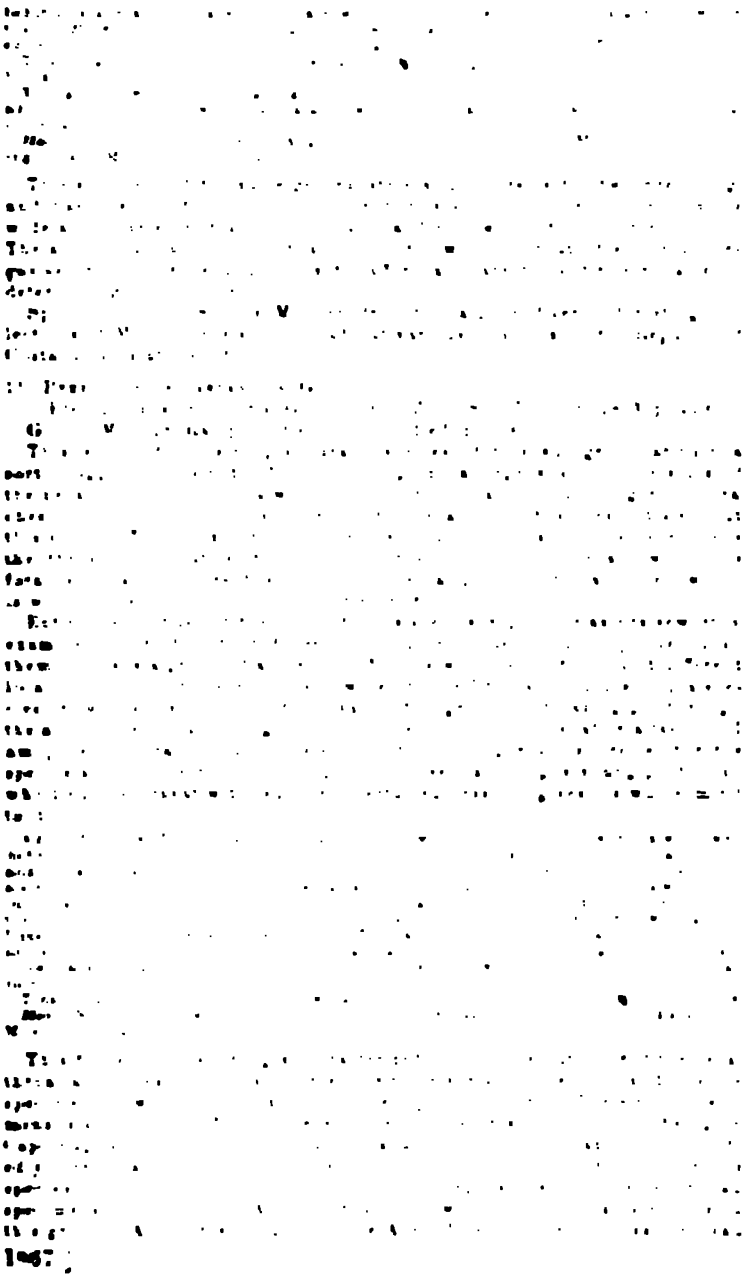
This species, if so, can be recognized mainly by its larger and longer bill, gradually curved and not so decidedly nor abruptly hooked at the end as in *P. torquatus*. The under parts in the specimen before me are more mixed or spotted with scarlet than in either of ten specimens of that species (*P. torquatus*) in the Acad. and Smiths. collections, and at the termination of the black on the neck in front there is a band of bright scarlet, narrower, but more complete than in either of them. It may be only a full plumaged or older specimen of that species!

The only specimen in Acad. Mus. is labelled "*Pteroglossus regalis*, ♂ ? Mexique," in a handwriting that I do not recognise.

10. PTEROGLOSSUS FRANTZII, Cabanis.

Pteroglossus Frantzii, Cab. Sitz. Bericht Naturf. Berlin, 1861. Jour. Orn. 1862, p. 332.

Like *P. torquatus* and *P. nuchalis*, and about the same size or rather larger, but with the abdominal band very wide and nearly pure scarlet. Upper mandible yellow, except the usual stripe on the culmen, which is black, and a space of dark greenish at base (yellow at the tip, which is black in *P. torquatus* and *P. nuchalis*). Chestnut-colored collar on the neck



entirely chestnut, with only frontal and superciliary stripes black. Three varieties of this species may be distinguished:

P. castanotis, a, *castanotis*.—Larger; head above black; total length about 20 to 22 inches. Northern, Rio Amazon, Peru.

b, *australis*.—Smaller; head above brownish-black; total length about 16 to 17 inches. Southern, Rio Parana.

c .....Entire head chestnut, with a frontal band and superciliary stripes black. Locality unknown. Perhaps young female of var. *castanotis*.

2. *Grammarhynchus*.

Genus Grammarhynchus, Gould, Monogr. Ramph. Intr. p. 26 (2d ed., 1854).

12. PTEROGLOSSUS INSCRIPTIS, Swainson.

Pteroglossus inscriptis, Swains. Zool. Ill. ii. p. (1820).

Pteroglossus scriptus, Temm. Man. d'Orn, i. p. 76 (1820).

Gould, Monogr. Ramph., 1st ed. pl. 23, 2d ed. pl. 23. Swains. Zool. Ill. ii. pl. 90.

This is the first of three species which form a sub-group of the genus *Pteroglossus*; all having the plumage dark green on the upper parts, and plain greenish-yellow on the under parts, without the bands and spots which are so conspicuous in the preceding sub-group, or typical *Pteroglossus*. These species resemble each other, but differ in size and other characters, especially the colors and markings of the bills, and are without exception represented with entire accuracy in Mr. Gould's Monograph of the Ramphastidæ.

Adult ♂. Small; bill with both mandibles yellow, tipped with black, the under mandible black at base, and a wide longitudinal band on the culmen black. Both mandibles with irregular black marks on their cutting edges (rather remotely resembling letters). Head and neck black; back, wings and tail dark green; rump scarlet; under parts of body greenish-yellow or lemon-yellow; tibiæ mixed with chestnut; legs dark green.

Adult ♀. Throat and sides of the neck dark chestnut, otherwise like the male.

Young ♂. Bill dull yellow, with the band on the culmen dull brown and indistinct, and tipped with dull brown. Head above black, throat chestnut; otherwise as in adult. Yellow of the under parts with obscure spots of dull reddish.

Total length about 13 inches; wing 4½, tail 5¼, bill (chord) 2¾ to 3¼ inches.

Hab.—Northern south America, Northern Brazil, "Guiana," "Para." Spec. in Mus. Acad. Philada.

Distinguished from the succeeding by the under mandible being yellow in a large middle space (the under mandible is entirely black in both of the succeeding.—*P. Humboldtii* and *P. viridis*). This is a common species in collections, and of which numerous specimens are in Acad. Mus., but none of them very carefully labelled for locality, being only given as "Brazil" and "Guiana."

13. PTEROGLOSSUS HUMBOLDTII, Wagler.

Pteroglossus Humboldtii, Wagl. Syst. Av. p. (1827).

Gould, Monogr. Ramph., 1st ed. pl. 22, 2d ed. pl. 22.

Resembles the preceding, *P. inscriptis*, but is larger, and has the under mandible black. Cutting edge of the upper mandible with irregular black marks, remotely resembling letters. Tibiæ chestnut, and in some specimens there are obscure marks of dull chestnut, forming an imperfect and partially concealed band on the abdomen. Plumage in both sexes as in the preceding.

Total length about 15 to 17 inches; wing 5 to 5½, tail 6 to 6½, bill (chord) 3¼ to 4 inches.

Hab.—Northern Brazil, "Upper Amazon," "Minas Geraes," Peru, "Head waters of the Huallaga River." Spec. in Mus. Acad. Philadelphia, and Mus. Smiths. Washington.

Clearly distinguished from the preceding by its black under mandible. Specimens in the extensive and valuable collection made by Mr. Walter S. Church, from the head waters of the Huallaga River, Peru, are the largest, and have a partial band on the abdomen, of chestnut, much more apparent than in specimens from Mr. Wallace's collections on the Upper Amazon. The

bill also seems more slender. Specimens in Acad. Mus. labelled "Upper Amazon."

14. PTEROGLOSSUS VIRIDIS (Linnæus).

Ramphastos viridis, Linn. Syst. Nat. i. p. 150 (1766).
Ramphastos glaber. Lath. Ind. Orn. i. p. 138 (1790).
Pteroglossus brevirostris, Less. Traite d'Orn. i. p. 178 (1831).
Gould, Monogr. Ramph. 1st ed. pl. 21, 2d ed. pl. 24. Swains. Zool. Ill. iii. pl. 169. Shaw, Nat. Misc. xvii. p 717. Buff. Pl. Enl. 727, 728. Le Vaill. Ois. Par. pl. 16, 17. Edwards' Birds, vii. pl. 330.

Like the preceding in colors and general characters, but without the irregular letter-like marks on either mandible. Upper mandible dull greenish-yellow, with a black line near to and parallel with the culmen; under mandible black. Plumage of the male much as in the preceding; head black, back, wings and tail dark green; under parts greenish-yellow; tibiæ green, mixed with dull chestnut.
Female. Head and neck chestnut; otherwise like the male.
Total length about 13½ inches; wing 4½ to 4¾, tail 4½ to 5, bill (chord) 3½ inches.
Hab.—Northern South America, "Guiana." Spec. in Mus. Acad. Philada.

Long known and common in collections from Guiana and Northern Brazil. Numerous specimens in Acad. Mus., but labelled only "Guiana" and "Brazil."

3. *Pyrosterna.*

Genus Pyrosterna, Bonap. Ateu. Ital. (1854.)

15. PTEROGLOSSUS BITORQUATUS, Vigors.

Pteroglossus bitorquatus, Vig. Zool. Jour. ii. p. 481 (1826).
Gould, Monogr. Ramph. 1st ed. pl. 16, 2d ed. pl. 26.

We now enter upon another well defined sub group, presenting brilliant colors, and with a wide belt of scarlet on the breast in all of the five species at present known. Very handsome, and distinguished from each other mainly by the colors of the bills.

Adult ♂. Bill with the upper mandible yellow, under mandible white at base, with its terminal half black. Head above black; throat and sides of the neck chestnut; a narrow crescent of pale yellow on the neck in front, succeeded by a wide transverse band of scarlet; abdomen pale yellow; tibiæ dull green. Wide space on the neck behind scarlet; back, wings and tail dark green; rump scarlet. Legs greenish-blue. Sexes alike?
Total length about 14 inches; wing 4½ to 5, tail 5½, bill (chord) 3¼ to 3½ inches.
Hab.—Northern South America, "Para," "Guiana." Spec. in Mus. Acad. Philada.

Of this gayly colored species four specimens are in the Acad. Mus., which are all that I have seen. It is easily distinguished by its white and black under mandible, and is accurately and very handsomely figured by Mr. Gould as above. Specimens in Acad. Mus. are labelled "Para" and "Guiana," and occasionally brought also in collections from New Grenada.

16. PTEROGLOSSUS STURMII, Natterer.

Pteroglossus Sturmii, Nat. in Imp. Mus. Vienna. Sturm ed. Gould Monog. (not paged, 1842.) Gould, Monog. Ramph. 2d ed. (1854.)
Gould, Monogr. Ramph. 2d ed. pl. 17. Sturm's ed. pl. 7.

Similar to the preceding, but smaller, and with the under mandible entirely black.
Hab.—Northern South America, "Rio Madeira" (Natterer). Spec. in Imp. Mus. Vienna

This species I have not seen. Its point of distinction from *P. bitorquatus* is mainly its black under mandible, but a few other characters are pointed out in Sturm's edition of Gould's Ramphastidæ, as above, and in Mr. Gould's second edition.

17. PTEROGLOSSUS FLAVIROSTRIS, Fraser.

Pteroglossus flavirostris, Fras. Proc. Zool. Soc. London, 1840, p. 60.
Pteroglossus Azaræ, Gould, Monog. Ramph., 1st ed. (nec Vieill.)
Gould, Monog. Ramph., 1st ed. pl. 17, 2d ed. pl. 29.

Generally resembling the two preceding, but with the scarlet belt restricted to the neck.

in front, and succeeded by a wide transverse belt of black, edged with scarlet on its lower border; abdomen greenish-yellow. Head above black; throat and sides of the neck chestnut; neck behind with a wide band of brownish-red or deep red (nearly scarlet). Back, wings and tail dark green, rump scarlet. Bill yellow, with a transverse band of orange near the cutting edge of the lower mandible; edge of the upper mandible black.

Totol length 12 to 15 inches; wing 4¼ to 5¼, tail 5 to 6½, bill (chord) 3¼ to 3¾ inches.

Hab.—Northern South America, New Grenada, Northern Brazil, Rio Negro, Rio Amazons, Para. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

This very handsome species is frequently received in collections from Bogota, and is readily distinguished from the two preceding by its wide band of black on the breast, the scarlet band being restricted to the neck in front. From the two species next succeeding, *P. Mariæ* and *P. Azaræ*, this bird is mainly distinguished by the colors of the bill.

18. PTEROGLOSSUS MARIÆ, Gould.

Beauharnaisius Mariæ, Gould, Monogr. Ramph. Intr. p. 22 (2d ed. 1854). Gould, Monogr. Ramph., 2d ed. pl. 30.

Much resembling the preceding, but smaller, and with the under mandible entirely dull orange or ochre color (not with a stripe only of that color on the lower mandible, as in *P. Azaræ*). Other colors as in *P. flavirostris*.

Total length 14 inches (Gould).

Hab.—Amazon River. Spec. in Mus.?

This species I have not seen.

19. PTEROGLOSSUS AZARÆ (Vieillot).

Ramphastos Azara, Vieill. Nouv. Dict. xxxiv. p. 282 (1819).

Pteroglossus nigridens, Temm. Man. d'Orn. i. p. 75 (1820).

Gould, Monogr. Ramp. 2d ed. pl. 28. Vieill. Gall. Supp. pl. 16. Le Vaill. Ois. Par. Supp. pl. A.

Resembling the two species immediately preceding, *P. flavirostris* and *P. Mariæ*, but with a wide longitudinal band in the upper mandible of orange-red; under mandible yellow. Colors of plumage as in *P. flavirostris*, and about the same size.

Total length 14¾ inches (Gould).

Hab.—Amazon River (Gould).

This species I have not seen.

4. *Beauharnaisius.*

Genus Beauharnaisius, Bonap. Consp. Av. i. p. 95 (1849).

20. PTEROGLOSSUS BEAUHARNAISII, Wagler.

Pteroglossus Beauharnaisii, Wagl. "Unterh. das Ausland, 1830, p. 470."

Pteroglossus Pœppigii, Wagl. Isis, 1832, p. 1230.

Pteroglossus lepidocephalus, Nitzsch. Pterylog. p. 136 (1840).

Pteroglossus ulocomus, Gould, Proc. Zool. Soc. London, 1833, p. 38.

Gould, Monogr. Ramph. 1st ed. pl. 18, 2d ed. pl. 25.

Differs from all other species in having the feathers of the head changed into a singular tissue resembling horn or whalebone, which are curled on the top of the head, flattened or spatulate on the occiput, and black (on the head above). Throat and sides of the neck with similar horn-like feathers, which are straight, and white, tipped with black. Back of the neck and rump carmine; back, wings and tail dark green. Breast yellow, with numerous small spots of scarlet; sides and a wide band on the abdomen scarlet; middle of the abdomen yellow; tibiæ green.

Total length 16 to 18 inches.

Hab.—Northern South America, Upper Amazon. Spec. in Mus. Acad., Philada.

A curious bird, easily recognized by its most singular head-gear, which has the appearance of being composed of curled shavings of horn or whalebone of a lustrous black color. Rare in American collections, but stated to be common enough in the countries on the Rio Amazons. Specimens in Acad. Mus. were received from European dealers.

5. *Baillonius.*

21. PTEROGLOSSUS BAILLONI (Vieillot).

Ramphastos Bailloni, Vieill. Nouv. Dict. xxxiv. p. 283 (1819).

Pteroglossus croceus, Jard. and Selb. Ill. Orn. i. (no page nor date.)
Gould, Monogr. Ramph. 1st ed pl. 20, 2d ed. pl. 41. Le Vaill. Ois. Parad. ii. pl. 18. Jard. and Selb. Ill. Orn. i. pl. 6.

A singular and anomalous form, not related specifically to any other. Head and entire under parts saffron-yellow. Rump crimson; upper parts of body, wings and tail yellowish-green. Sexes alike.
Total length about 15 to 16 inches.
Hab.—Central and Eastern South America, Brazil. Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

Quite common in collections from Brazil. This peculiar and oddly-colored species seems to be most properly arranged here, though usually rated as an *Andigena*. It does not intimately resemble any other species of Toucan.

The following may be an additional species of *Pteroglossus*, but is doubtful, and unknown to modern naturalists.

25. PTEROGLOSSUS ALDROVANDI (Shaw), Wagler, Syst. Av. sp. 1 (1827).
Ramphastos Aldrovandi, Shaw, Gen. Zool. viii. p. 366 (1811).
Ramphastos picatus, Linn. Syst. Nat. i. p. 152 (12th ed. 1776)?
Albin's Birds, ii. pl. 25.

"This bird is little bigger than the common *Magpie;* the head, neck, and upper part of the back towards the neck, are black; the rest of the back and wings show something of a cinereous whiteness. The breast shines with a most bright and lovely gold or saffron color, with a certain redness near the beginning; the belly and thighs of a most beautiful vermillion or scarlet color. The red color reaches almost half-way of the tail, and is intercepted by a broad bar of black, and ending in a beautiful red; the legs, feet and claws are black."

"Its bill is very large, considering the bigness of the bird; its length was six inches, breadth at the upper part towards the head two inches and a quarter, the circumference at the same place five inches and a half; the upper chap is large and somewhat hooked, with a cavity exactly fitting the under chap, both serate (*sic*) or toothed, and of a thin bony substance, and a covering over that of a horny-like scale, both very thin and light, weighing but eight drachms. It was of a yellowish color, clouded with a darkish green, towards the end or point reddish; its nostrils were situate just above the horny substance of the bill, adjoining to the head, which is large and thick, as is suitable and requisite to sustain a bill of that length and bigness."—A Natural History of Birds, illustrated with two hundred and five copper plates curiously engraven from life, and exactly colored by the author, Eleazer Albin. To which are added Notes and Observations by W. Derham, D. D., Fellow of the Royal Society. London, 1738 (vol. ii. p. 24).

The peculiarities of the bird here described are the abdomen and thighs being scarlet, and the tail being scarlet at base and tipped with "beautiful red." The plate, "exactly colored," seems to represent a *Pteroglossus*, but of a species quite unknown, and, in fact, has much the appearance of a fictitious specimen, though Albin, as above (ii. p. 24), intimates that he has seen it living. It is the sole authority for the species.

III. Genus SELENIDERA, Gould.

Genus Selenidera, Gould, Icon. Av. pt. i. (1837).

1. *Selenidera.*

1. SELENIDERA MACULIROSTRIS (Lichtenstein).
Pteroglossus maculirostris, Licht. Verz. p. 7 (1823).
Ramphastos maculatus, Vieill. Gal. Ois. ii. Supp. p. (1834).
Gould, Monog. Ramph. 1st ed. pl. 24, 2d ed. pl. 31. Vieill. Gal. ii. Supp. pl. 14, 15. Jard. and Selby, Ill. Orn. i. pl. 26. Le Vaill. Ois. Par. pl. 15, Supp. pl. A.A.

With this species we again enter upon a group resembling each other in colors of plumage, but distinguished by different colors and markings of the bills. All the species are smaller than in either of the preceding groups, *Ramphastos* or *Pteroglossus*, and form apparently a natural and readily defined group, probably generic. All the species are singularly alike in colors of plumage, and are nearly of the same size. They are, without exception, represented with extraordinary accuracy in Mr. Gould's Monograph of the Family *Ramphastidæ*. The ear coverts are yellow in all known species of this group, and present an immediately available generic character.

Adult ♂. Bill pale bluish or greenish-white, darker on the culmen and at the base; upper mandible with about four or five irregular transverse bars of black, the last of which nearest the tip, extends to the under mandible also, forming a very distinct and nearly perfect transverse band across both mandibles near the end. Head, neck and breast glossy black; ear coverts orange nearest the eye, pale yellow posteriorly. Narrow band of yellow on the back of the neck; back, wings and tail dark olive-green, tinged somewhat with yellowish on the back and rump. Flanks with a large spot of orange; abdomen yellowish-green; under tail coverts scarlet. About six middle tail feathers, tipped with chestnut. Feet greenish-brown.

Adult ♀. Head, neck and breast reddish-chestnut; otherwise much as in the male.

Total length about 12 to 13 inches; wing 5 to 5¼, tail 4½, to 5, bill (chord) 2¼ inches.

Hab.—Central and eastern Brazil, Rio de Janeiro, St. Katharines, Bahia. Spec. in Mus. Smiths. Washington, and Mus. Acad. Philada.

Abundance of specimens of this species in Smiths. Mus. and Acad. Mus., but not specially stating locality; nor is there any specimen in young or immature plumage. It is brought commonly from Brazil.

2. SELENIDERA GOULDII (Natterer).

Pteroglossus Gouldii, Natt. Proc. Zool. Soc. London, 1837, p. 44.
Gould. Monog. Ramph. 2d ed. pl. 32. Icon. Av. pl. 7.

Much resembling the preceding, and about the same size, but with the basal half to two-thirds of the upper mandible black (not with transverse bars or bands, as in that species, *S. maculirostris*). Under mandible with one transverse band near the tip. Large spaces on the flanks deeper orange.

♀. Very nearly as in *S. maculirostris*, but with the upper mandible black at base, as in the male.

Total length 12 to 13 inches.

Hab.—Northern South America, Para, Rio Amazons. Spec. in Mus. Acad. Philada.

Easily distinguished by the black of the upper mandible, and inhabits more northern regions of South America than *S. maculirostris*. Specimens in Acad. Mus. labelled "Para" and "Rio Amazons," the latter from Mr. Wallace's collections.

3. SELENIDERA LANGSDORFFII (Wagler).

Pteroglossus Langsdorffii, Wagl. Syst. Av. (1827.)
Gould, Monog. Ramph. 1st ed. pl. 28, 2d ed. pl. 33.

Resembling the preceding two species, but with the bill entirely bluish-black, paler at base, especially of the under mandible. Colors of the plumage much as in the preceding, in both sexes.

Total length about 12 to 13 inches.

Hab.—Western South America, Peru, Amazon River (Lieut. Herndon). Spec. in Smiths. Mus. Washington, and Mus. Acad. Philada.

This species has the upper mandible uniform bluish-black or dark horn-color, paler at base; under mandible with the paler base extending to one-half to two-thirds of its length, bluish black in the terminal portion. Easily distinguished from the two preceding or other species by these colors of the bill. Lieut. Herndon's specimens in Smiths. Mus. are labelled "Amazon River," but as he crossed the continent on the route of that river, they are probably from its western or head waters. Other specimens in Acad. Mus. are from Peru.

4. SELENIDERA REINWARDTII (Wagler).

Pteroglossus Reinwardtii, Wagl. Syst. Av. (1827.)
Gould, Monog. Ramph. 1st ed. pl. 26, 2d ed. pl. 34.

Like the preceding, but with the bill dull red in the basal two-thirds of both mandibles; terminal one-third bluish-black. Plumage in both sexes much as in the preceding. Size perhaps rather larger.

Total length 12½ to 13½ inches.

Hab.—Western South America, Peru, Ecuador? Spec. in Mus. Acad. Philada.

Having an entirely peculiar coloring of the bill, and inhabiting western and perhaps north-western South America. Mr. Gould mentions a specimen which was probably from the country on the Rio Napo. Specimens in Acad. Mus. are from Peru.

5. SELENIDERA NATTERERI (Gould).

Pteroglossus Nattereri, Gould, Proc. Zool. Soc. London, 1835, p. 157.

Gould, Monog. Ramph. 1st ed. pl. 25, 2d ed. pl. 35.

Bill red, but with culmen green, and with several irregular transverse bars of greenish-black across both mandibles, widest at the base. Ear coverts pale yellow nearest the eye, orange posteriorly (the reverse of all the preceding species). Chestnut color of the tibiæ extending on the flanks. Plumage generally as in all the preceding in both sexes.

Total length 12 to 13 inches.

Hab.—Northern South America, Rio Negro, British Guiana. Spec. in Mus. Acad. Philada.

Differing again from all of the preceding in the colors of the bill, and having the colors of the ear spot reversed, as above described. Spec. in Acad. Mus. labelled as above.

2. *Piperivorus.*

Genus Piperivorus, Bonap. Ois. De Lattre, p. 84 (1854).

6. SELENIDERA PIPERIVORA (Linnæus).

Ramphastos piperivorus, Linn. Syst. Nat. i. p. 103 (1758).

Pteroglossus culik, Wagl. Syst. Av. (1827.)

Gould, Monog. Ramph., 1st ed. pl. 27, 2d ed. pl. 36. Buff. Pl. Enl. 577, 729. Edwards' Birds, vii. pl. 330. Le Vaill. Ois Parad. pl. 13, 14.

This species, though having in the male the same general colors of plumage as all the preceding species of the genus *Selenidera*, differs in the bill being longer and more strongly curved, and the plumage of the female is different from that of those species, and quite peculiar. The bill somewhat approaches that of *Pteroglossus*, and this species may be regarded as an analogue of that group in the present, just as the next species represents *Ramphastos*. This species, undoubtedly, as Mr. Gould remarks with his usual accuracy and excellent judgment, is properly to be retained in this genus.

Adult ♂. Upper mandible red at base, with its terminal seven-eighths black; under mandible with its basal one-half red, and its terminal one-half black (base of bill dull reddish-yellow in dried specimens). Ear spot yellow, or very slightly tinged with orange. Large space on the flanks yellowish-green, scarcely distinguishable in some specimens. Other plumage as in the preceding, but with the green of the upper parts darker. All the tail feathers tipped with chestnut.

Total length 12½ to 13½ inches.

Adult ♀. A wide space on the neck behind chestnut; top of the head black. Back, wings and tail green, the back with a yellow tinge. Throat, neck before and breast fine bluish-gray, with a greenish tinge running into yellowish-green on the abdomen. Tibiæ chestnut, generally mixed with green; under tail coverts scarlet; tail feathers tipped with chestnut. Legs greenish-brown.

Hab.—Northern South America, Guiana, Cayenne, Rio Amazons. Spec. in Mus. Acad. Philada.

Numerous specimens in Acad. Mus., labelled as above.

3. *Ramphastoides.*

7. SELENIDERA SPECTABILIS, Cassin.

Selenidera spectabilis, Cass. Proc. Acad. Philada. 1857, p. 214.

Jour. Acad. Philada. iv. pl. 1 (quarto).

The largest species of this genus, and with the bill larger and wider vertically. Easily distinguished from either of its congeners by its size and the colors of the bill, though having the same general colors of plumage. Ear coverts yellow.

Adult ♂. Colors of the upper mandible divided obliquely by a line from below the nostril to the edge of the upper mandible within its terminal one-third. Upper portion and tip greenish-yellow (in dried specimen); lower portion and under mandible greenish-black, paler at base. Bill at base with a line of black (as in species of *Rhamphastos*). Ear spot light yellow; flank with a large spot of orange-yellow. Head, neck and body below glossy black; back and wings dark olive-green. Under tail coverts scarlet; tibiæ chestnut. Tail greenish-blue, with gray tinge (uniform, and having no chestnut tips). Legs bluish-brown.

Adult ♀. Bill as in the male. Head above and neck behind dark chestnut; other plumage as in the male.

Total length about 15 inches; wing 5¼, tail 5, bill (chord) 4 inches.

Hab.—Northern South America, Central America. "Cocuyas de Veragua, New Grenada" (Mr. Robert W. Mitchell), "Province of Choco, New Grenada" (Mr. W. S. Wood Jr.), Costa Rica (Mr. J. Carmiol). Spec. in Mus. Smiths. Washington, and Mus. Acad. Philada.

Specimens in Smiths. Mus. are in the valuable collections of Mr. Julian Carmiol, from Costa Rica, and from Captain Michler's collection from the Rio Atrato. Mr. Mitchell's type specimens in Acad. Mus. are from New Grenada, as above.

IV. Genus AULACORAMPHUS, G. R. Gray.

Genus Aulacoramphus, G. R. Gray, List Gen. 1840, p. 50.
Aulacorhynchus, Gould, Proc. Zool. Soc. London, 1834, p. 147.

1. *Aulacoramphus.*

1. AULACORAMPHUS SULCATUS (Swainson).

Pteroglossus sulcatus, Swains. Jour. Roy. Inst. ix. p. 267.
Swains. Zool. Ill. i. pl. 44. Temm. Pl. Col. 356. Gould, Mon. Ramph., 1st ed. pl. 31, 2d ed. pl. 42.

Entire plumage grass-green, darker on the upper parts of the body, wings and tail lighter, and tinged with yellow on the under parts; throat bluish or grayish-white; cheeks and narrow stripe over the eye blue. (Rump green, uniform with the back.) Both mandibles with wide, very distinct grooves throughout their length. Upper part of upper mandible and tip of under mandible brownish-red; lower part of upper mandible black. Under mandible, at base, red (tip brownish-red); intermediate space black. Legs greenish-brown. Tail bluish at the end (not tipped with reddish-brown, as in the next succeeding).

Total length about 13 inches; wing 4⅛ to 5⅛, tail 5, bill (chord) 2½, to 3 inches.

Hab.—Northern South America, Venezuela. "Caracas." Spec. in Mus. Acad. Philada.

Easily distinguished by the grooved or *sulcate* bill, but especially that character in the under mandible. In the specimens now before me there is considerable difference in size, and especially in that of the bill; and in one specimen, obtained at Caraccas, the bill measures 2¼ inches, wing 4¼ inches. In the largest specimen the bill is 3 inches, wing 5½ inches. Several specimens in Acad. Mus.

This species is the type of a group, undoubtedly generic, first indicated by Mr. Gould under the name *Aulacorhynchus*, but which, having been previously used, was changed by Mr. Gray to *Aulacoramphus*, as above. It is a singularly uniform group in coloring, all of the eleven species at present known being of grass-green and yellow colors, though the species are for much the greater part more strongly distinct from each other than in any other group of this family. My present impression is that size is an uncertain character in this genus, and more variable, and generally so, in the same species than usual.

2. AULACORAMPHUS DERBIANUS (Gould).

Aulacorhynchus Derbianus, Gould, Proc. Zool. Soc. London, 1835, p. 49.
Gould, Mon. Ramph. 1st ed. pl. 32, 2d ed. pl. 43.

Upper mandible only sulcate; except with a wide transverse band of pale blue; longer tail feathers tipped with reddish-chestnut. (Rump green, uniform with the back.) Both mandibles at base brownish-red; tip of upper mandible red; intermediate space of both mandibles black. Entire other plumage grass-green; throat bluish or grayish-white; cheeks of the same, but over the eye bluish-white; line at base of bill white, and very conspicuous. Larger than the preceding.

Total length about 14 to 15 inches.

Hab. Western South America, Peru (Dr. W. S. W. Ruschenberger, U. S. Navy), "Columbia" (Mr. J. P. Verreaux's label), Bolivia (Mr. Gould).

Resembling the preceding in colors, but easily distinguished by the large occipital band of pale blue, and has the longer tail feathers tipped with chestnut (which is not the case in the preceding, *A. sulcatus*). The under mandible is not grooved, as in the preceding.

Of this species, specimens from Peru seem to have the bills darker than in others labelled as from "Columbie" in Mr. Jules Verreaux's hand-writing, though otherwise quite similar. In the Acad. Mus. there are specimens in very fine plumage from the "Province of Curco, Peru," in the valuable collections presented by Dr W. S. W. Ruschenberger, of the United States Navy.

3. AULACORAMPHUS CASTANEORHYNCHUS (Gould).

Pteroglossus (Aulacorhynchus) castaneorhynchus, Gould, Ann. and Mag. Nat. Hist. 1842, p. 238.

Aulacoramphus castaneirostris, Bonap. Ois. Delattre, p. 84 (1854).

Gould, Mon. Ramph. 2d ed. pl. 44.

Larger. Bill fine chestnut-red, culmen usually black; large space in middle of under mandible usually black; line of white at base of bill wide and very distinct, especially on under mandible. Rump scarlet; longer feathers of the tail widely tipped with brownish-chestnut. Entire plumage grass-green, with a golden tinge on the neck behind and back, paler and strongly tinged with blue on the under parts, especially the breast; middle tail feathers strongly tinged with blue; cheeks and small spot over the eye blue.

Total length about 17 to 19 inches.

Hab.—Northern South America, New Grenada, "Bogota." Spec. in Mus. Acad. Philada.

The largest species of this group. Much resembling the preceding, *A. Derbianus*, but with the rump scarlet. In three specimens now before me in Acad. Mus., no two are exactly similar in the colors of the bill, and one only corresponds in that respect with Mr. Gould's beautiful plate of this species. In two others a band of black is strong and well-defined on the culmen and on the middle of the lower mandible. In the one specimen the black of the culmen is much more restricted and less clearly defined, and the under mandible almost entirely black.

Easily distinguished from either of the preceding by its scarlet rump and larger size. Specimens in Acad. Mus. from Bogota.

4. AULACORAMPHUS HÆMATOPYGUS (Gould).

Pteroglossus hæmatopygus, Gould, Proc. Zool. Soc. London, 1834, p. 147.

Gould, Mon. Ramph. 1st ed. pl. 33, 2d ed. pl. 45.

Like the preceding, *A. castaneorhynchus*, but smaller, and with a shorter and stouter bill. Total length 14 inches (Mr. Gould).

Hab.—Ecuador. Spec. in coll. Mr. John Gould, and Dr. P. L. Sclater, London.

In the large collection now under examination I have no specimen which exactly corresponds with Mr. Gould's plate and description, but I do not find any characters which might not readily be found in the young of the preceding, *A. castaneorhynchus*, especially in view of the liability to variation which seems to prevail in this group. One specimen only known to Mr. Gould, but this species is given by Dr. Sclater in List of Birds from Pallatanga, Ecuador. (Proc. Zool. Soc., London, 1859, p. 146).

5. AULACORAMPHUS CÆRULEICINCTUS (D'Orbigny).

Aulacoramphus cæruleicinctus, D'Orb. Voy. Am. Ois. p. 382 (1844).

Pteroglossus Lichtensteini, Sturm ed. Gould's Monog. (not paged, 1845).

D'Orb. Voy. Am. Mer. Ois. pl. 66. Gould, Mon. Ramph. 2d ed pl. 46

Large; bill dark bluish horn-color, with the tip and edges of both mandibles yellowish-white. Wide transverse band on the breast pale blue. Rump red; tips of longer tail feathers brownish-chestnut; throat bluish-white; cheeks blue; line over the eye bluish-white. Entire other plumage grass-green, tinged with yellow on the abdomen and under tail coverts.

Total length from 14 to 16 inches.

Hab.—Western South America, Bolivia, "Columbie." Spec. in Mus. Acad. Mus. Smiths. Washington.

The bluish or horn color of the bill is peculiar, and immediat the recognition of this species. Five specimens in Mus. Acad.

and also in length and thickness of bill, two specimens from D'Orbigny's collections being the smallest, and probably not adult. These last are from "Yungas, Bolivia." Others are labelled "Columbie," in the hand-writing of Mr. Jules Verreaux. The wide pectoral band of pale blue is also a strong and peculiar feature in this species.

One specimen of this fine species is in the very interesting and valuable collection presented to the Smithsonian Institution by the Hon. D. K. Cartter, of Washington, D. C., and made by him while Minister of the United States to the republic of Bolivia.

2. *Ramphoxanthus.*

Genus Ramphoxanthus, Bonap. Ois. De Lattre, p. 84 (1854).

6. AULACORAMPHUS PRASINUS (Gould).

Pteroglossus prasinus, Gould, Monog. Ramph. 1st ed. p. (1834).
"Pteroglossus prasinus, Lichtenstein." Gould, as above.
Gould, Mon. Ramph. 1st ed. pl. 29, 2d ed. pl. 47.

Upper mandible yellow, with a longitudinal stripe on its cutting edge black; spot at the base of the culmen black, passing into chestnut-red anteriorly, and a small irregular spot of black below the nostril; under mandible black. Under tail coverts chestnut, and all the tail coverts tipped with chestnut. Throat and cheeks white, frequently tinged with yellowish or bluish. Entire other plumage grass-green, tinged with golden on the head and neck behind, and with blue on the under parts of the body, at the ends of the shorter quills, and towards the ends of the longer tail feathers.

Total length 13 to 14½ inches; wing 5, tail 5 to 5½ inches.

Hab. Mexico, Jalapa (Mr. D'Oca), Orizaba (Prof. F. Sumichrast), Mirador, near Vera Cruz (Dr. C. Sartorius), Guatemala, Coban, Cluseo (Mr. Henry Hague). Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

An abundant species in American collections, and contained in all the various and interesting collections from Jalapa, Mexico, sent to the United States by Mr. Raphael Montes D'Oca. Also, usually in the very fine collections from Orizaba sent by Prof. Sumichrast, and from Mirador by Dr. Sartorius, to the Smithsonian Institution. Specimens in the Smiths. Museum from "Central Guatemala" are in a very valuable collection made by Mr. Henry Hague.

This is the first of several species in which the upper mandible is yellow, as above described. Very handsomely figured by Mr. Gould, as above cited. The line at the base of the bill in this species is yellow.

7. AULACORAMPHUS WAGLERI (Sturm).

Pteroglossus Wagleri, Sturm, ed. Gould's Mon. Ramph. (not paged, 1845).
Pteroglossus pavoninus, Gould, Proc. Zool. Soc. London, 1835, p. 158.
"Pteroglossus pavoninus, Mus. Mun.," Gould, as above.
Gould, Mon. Ramph. 1st ed. pl. 30, 2d ed. pl. 48.

Like the preceding, *A. prasinus*, but with the base of the upper mandible black (yellow in *A. prasinus*), and the line at the base orange-yellow.

Total length about 14 inches.

Hab.—Mexico? Spec. in Imp. Mus. Vienna.

This species I have not seen, but from Mr. Gould's and Mr. Sturm's descriptions and figures I have no doubt that it is an entirely valid and respectable species.

8. AULACORAMPHUS ALBIVITTATA (Boissoneau).

Pteroglossus albivitta, Boiss. Rev. Zool. 1840, p. 70.
Pteroglossus microrhynchus, Sturm, Mon. Ramph. (name on plate).
Gould, Mon. Ramph. 2d ed. pl. 49.

Like the two more closely preceding, *A. prasinus* and *A. Wagleri*, but with a wide transverse band of white and conspicuous narrow and yellow in those species. Upper part of [illegible] mandible yellow, lower part black; a narrow band across the culmen [illegible] as in *A. prasinus*.

Total length about [illegible]

Hab.—[illegible] Spec. in Mus. Acad. Philada. and Smiths. Washington.

Frequently received in Bogota collections, and several specimens in Acad. Mus. are labelled "Columbie" in Mr Verreaux's hand-writing. Much resembling the two preceding, especially *A. prasinus*, but easily recognized by its white band at the base of the bill. The black portion of the under mandible is also much wider.

9. AULACORAMPHUS ATROGULARIS (Sturm).

Pteroglossus atrogularis, Sturm ed. Gould's Mon. Ramph. (not paged, 1845). Gould, Mon. Ramph. 2d ed. pl. 50.

Throat black. Upper part of upper mandible yellow, lower part black; upper mandible with a line of white at base, frequently tinged with yellow, or with a line of white and another of yellow at base. Under mandible black, with a wide line of white at base, sometimes tinged with yellow. Colors generally as in *A. prasinus* and *A. bivittatus*.

Total length 12½ to 15 inches.

Hab.—Western South America, "Peru, Ecuador" (Mr. Gould), "Columbie" (Mr. Verreaux's label). Spec. in Mus. Acad. Philada.

The peculiarity of this species is the black throat, which character is strongly defined in two specimens in Acad. Mus., but in one other the throat is black, tinged and edged with blue. This specimen is, however, evidently not adult.

10. AULACORAMPHUS CÆRULEOGULARIS, Gould.

Aulacoramphus cæruleogularis, Gould, Proc. Zool. Soc. London, 1853, p. 45.

.Gould, Mon. Ramph. 2d ed. pl. 51.

Throat and cheeks blue. Upper mandible with a wide transverse band of reddish-chestnut at base, and also a longitudinal band of black in the basal one-third of the culmen. Upper part of upper mandible yellow, lower part black; under mandible black; a wide line at base of bill yellow in upper mandible, wider and white in the lower mandible. Inferior tail coverts chestnut; all the tail feathers tipped with chestnut. Entire other plumage grass-green, strongly tinged with golden on the head, and with yellow on the abdomen. Legs bluish-brown.

Total length about 12½ to 14 inches; wing 4½ to 5, tail 4½, bill (chord) 2¾ to 3 inches.

"Iris black, length 14 inches" (Dr. A von Frantzius). "Iris brown, length 14½ inches" (Mr. J. Carmiol). "♀, length 13 inches."

Hab.—Costa Rica, "Berris," "La Palma," "San Jose" (Dr. A. von Franzius), "Dota," "Barranca," "Turrialba" (Mr. J. Carmiol), Veragua (Mr. Gould). Spec. in Mus. Smiths. Washington.

Numerous specimens in the Smiths. Coll., exclusively from Costa Rica. This species strongly resembles the immediately preceding, *A. atrogularis*, but has the throat blue instead of black, and the plumage of the head is glossed with golden yellow, and in other respects it is quite distinct and easily recognized. Seems to be the most abundant species of Toucan inhabiting Costa Rica.

11. AULACORAMPHUS CYANOLÆMUS, Gould.

Aulacoramphus cyanolæmus, Gould, Proc. Zool. Soc. London, 1866, p. 24.

"Male. Bill black, with a small mark of yellow at the tip of the upper mandible, and a band of white at the base of both mandibles, except on the culmen; this white band is much narrower on the upper than on the under mandible, and moreover has the posterior half of its breadth pale yellow. Naked skin around the eyes dull red; throat grayish-blue, approaching to violet, and becoming of a deeper tint where it joins the green of the neck; a tinge of blue also appears at the base of the ear coverts, towards the bill, and over the eye, where, however, it becomes of a greener hue. Plumage of the head and body deep grass-green, with a wash of yellow on the flanks; primaries black, edged with brown; under surface of the wing pale yellow; tail feathers deep green, conspicuously tipped with chestnut; under tail coverts chestnut-brown; legs green."

"Total length of male 12 inches; bill 2⅞, wing 5¼, tail 5½, tarsi 1¼."

"Female. Precisely similar in color, but, as is the case with all the other species of the genus, much smaller than the male."

"*Hab.*—Loxa in Ecuador."

"*Remark.*—This well marked species is allied to the *Aulacoramphus cæruleigularis* ma and the *A. atrigularis* of Peru, but differs from the former in the smaller on the throat, from the latter in having no trace of black on that part, and fi markings of the bill." (Mr. Gould.)

This is Mr. Gould's description, but the species is unknown

V. Genus ANDIGENA, Gould.

Genus Andigena, Gould, Proc. Zool. Soc. London, 1850, p. 93.

1. *Andigena.*

1. ANDIGENA HYPOGLAUCUS (Gould).

Pteroglossus hypoglaucus, Gould, Proc. Zool. Soc. London, 1833, p. 70.
Gould, Mon. Ramph. 1st ed. pl. 19, 2d ed. pl. 38.

Bill with its basal one-half yellow, enclosing a nearly triangular spot of black near the base; terminal portion of upper mandible red; terminal portion of the under mandible black. Head above black; back and wing coverts reddish-brown; rump yellow; outer webs of quills dark green. Under parts and band around the neck light blue or bluish-gray; tibiæ chestnut; under tail coverts scarlet; tail greenish-black, the four middle feathers tipped with chestnut; legs bluish-brown.

Total length 17 to 18 inches; wing 6½, tail 6½ to 7, bill 4 inches.

Hab. - Western South America, Peru (Hon. J. Randolph Clay, "Columbie" (Mr. J. Verreaux's label). Spec. in Mus. Acad. Philada.

This is an oddly colored species, two specimens of which in the Acad. Mus. are all that I have seen. One specimen in excellent plumage is in the interesting collection made by the Hon. John Randolph Clay in Peru, while Minister of the United States to that country; and the other was received from the establishment of the Messrs. Verreaux, Paris. These specimens have the bills differing somewhat in size and length, but are otherwise quite similar.

This is the type of a very peculiar group, certainly of generic value, and so described and named as above by that great naturalist, Mr. John Gould, of London. All of the known species are of rather plain but grotesque and oddly arranged colors. This lot is evidently what my lamented and accomplished friend and associate, the late Dr. Wilson, was accustomed to call "the *eccentric* type" of the Toucans.

2. ANDIGENA LAMINIROSTRIS, Gould.

Andigena laminirostris, Gould, Proc. Zool. Soc. London, 1850, p. 93.
Gould, Mon. Ramph. 2d ed. pl. 37.

Bill with a raised plate or lamina of yellow in its basal half; band at base of bill red, other parts of bill, black. A large spot on each flank orange-yellow. Head above and neck behind black; back and wings light brown or snuff-color; rump greenish-yellow. Under parts light blue; tibiæ dark chestnut; under tail coverts scarlet; tail bluish-black, the four middle feathers tipped with chestnut; legs bluish-brown.

Total length about 18 inches; wing 6½ to 7, tail 6½ to 7, bill 3½ inches.

Hab. - Ecuador (Hon. Charles R. Buckalew). Spec. in Mus. Acad. Philada. and Mus. Smiths. Washington.

Strongly characterized by the curious raised plate in the basal half of the upper mandible. The colors of the plumage in this strange Toucan resemble those of the preceding, *A. hypoglaucus*, but differ entirely in the bill, and in the present bird there is no extension of the color of the under parts around the neck behind, and it has large spots of orange on the flanks.

The fine collection made in Ecuador by that accomplished gentleman and statesman, the Hon. Charles R. Buckalew, late Minister of the United States to that country, and now United States Senator from Pennsylvania, contained several excellent specimens of this curious bird, very similar in their colors and other characters. Mr. Buckalew's collection was presented by him to the Smithsonian Institution.

3. ANDIGENA CUCULLATUS (Gould).

Pteroglossus cucullatus, Gould, Proc. Zool. Soc. London, 1846, p. 69.
Gould, Mon. Ramp. 2d ed. pl. 40.

Much resembling *A. hypoglaucus*, but with the bill yellow in its basal two-thirds and black in its terminal one-third, under mandible with a black spot near its base. Tail black, not tipped with chestnut. Plumage nearly as in *A. hypoglaucus*.

Total length about 18 inches.

Hab. - Bolivia. Spec. in Brit. Mus. London.

This species is not in any American collection, to my knowledge, and seems to

e only known from three specimens obtained in Bolivia by Mr. Thos. Bridges, nd now or recently in British collections. I am not without a suspicion that his bird is the young of *A. hypoglaucus*, which, judging from Mr. Gould's excellent plate and description, it closely resembles, except in the colors of the ill.

2. *Ramphomelas.*

Genus Ramphomelas, Bonaparte, Ois. De Lattre, p. 84 (1854).

. ANDIGENA NIGRIROSTRIS (Waterhouse).

Pteroglossus nigrirostris, Waterh. Proc. Zool. Soc. London, 1839, p. 111.
Pteroglossus melanorhynchus, Sturm, ed. Gould's Mon. Ramph.
Gould, Mon. Ramph. 2d ed. pl. 39.

Bill black. Head above and neck behind black; back and wing coverts sienna-brown; pper tail coverts pale yellow. Throat and sides of the neck bluish-white; under parts of ody pale blue; under tail coverts scarlet; tibiæ dark chestnut; quills greenish-black, dged externally with brown; tail bluish or greenish-black, the longer feathers tipped ith chestnut; legs greenish-black.
Total length 18 to 19 inches; wing 6½ to 7, tail 8, bill 4 to 4½ inches.
Hab.—Northern South America, Bogota, "Columbie." Spec. in Mus. Acad. Philada.

Easily recognized by its entirely black bill, and not intimately resembling ither of its preceding congeners. Specimens in Mus. Acad. were received from urope, and are labelled "Bogota" and "Columbie."

. ANDIGENA SPILORHYNCHUS, Gould.

Andigena spilorhynchus, Gould, Proc. Zool. Soc. London, 1858, p. 149.

"Crown of the head and back of the neck glossy black; back, wing coverts nd margins of the primaries dull sienna brown, secondaries bluish-brown; pper tail coverts blue, strongly tinged with green; tail slaty-blue, tinged ith green, the four central feathers largely tipped with chestnut; band cross the rump sulphur-yellow. Throat and cheeks white, blending into he light blue of the breast and abdomen; thighs rich chestnut; under tail overts blood-red; feet greenish-blue, with a lilac tinge on their under surace; bill black, with a mark of obscure brownish-red at the base of the upper andible, which, when viewed in front, much resembles the letter W; this olor advancing for a short distance on each side of the culmen, and extending down the sides of the base."

"Total length 18 inches; bill 3¾, wing 7, tail 7½, tarsi 1¾."

"*Hab.*—Forests of Beza, on the eastern side of the Cordillera, in Ecuador."

"Differs from *A. nigrirostris* in the bill being shorter, broader and much nore robust, and colored with obscure brownish-red at the base of the upper nandible."

One specimen in Acad. Mus. seems to approach this description, but not ufficiently. It may be the young of *A. nigrirostris*. Dr. Sclater possesses pecimens from the Rio Napo, Ecuador, and says: "scarcely different from *A. igrirostris*." (Cat. Am. B. p. 327.)

The following have been described as species of *Ramphastos*, but are either ot so, or the descriptions are not sufficient:

. RAMPHASTOS ALBUS, Gm. Syst. Nat. i. p. 357 (1788).

White Toucan, Lath. Syn. i. p. 336.

"All that we know of this species is that the bird is wholly of a pure white, nd that it is now, or was very lately, alive in the menagerie of the King of laples." Which small matter of information has in nowise increased that I now of. Not given by Latham in Gen. Hist., subsequently published.

. RAMPHASTOS PULCHER, Müll. Syst. Nat. Supp. p. 84 (1776).

Ramphastos pavoninus, Gm. Syst. Nat i. p. 353 (1788).
Tucana Mexicana viridis, Briss. Orn. iv. p. 423 (1760).
Xochitenucatl, Hernandez, His. Nov. Hisp. p. 51 (1651).

"Avis est Psittaci magnitudine et forma, ac pene tota viridis, insertis tamen nonnullis pennis rubescentibus, pauoninisque aliis; verum crura, pedesque nigra sunt et tenuia; rostrum incuruum, quaternas pene vncias longum, serratumque, vnde nomen, et luteo, ac nigro varium colore; calidarum regionum atque maritimarum Incola est, neque alium (quod nouerim) quam plumae praestat vsum." Hernandez, as above.

This description has been done into various languages by competent hands, but remains the sole authority for the species. It seems to be more like a Trogon than a Toucan.

3. RAMPHASTOS FLAVUS, Müll. Syst. Nat. Supp. p. 84 (1776).
Ramphastos luteus, Gm. Syst. Nat. i. p. 353 (1788).
Tucana lutea, Briss. Orn. iv. p. 432.

"Tucana dilute lutea; taenia utrinque longitudinali a rostro ad pectus usque nigra; tectricibus alarum superioribus minimis luteis; rectricibus albo et nigro variis."

"Habitat in Mexico." Brisson, as above.

Probably not a bird of this family. Brisson seems to abridge from "Eus. Nieremb. pag. 209," which author is not included in my circle of antique acquaintances.

4. RAMPHASTOS GLAUCUS, Müll. Syst. Nat. Supp. p. 84 (1776).
Ramphastos caeruleus, Gm. Syst Nat. i. p. 357 (1788).
Tucana caerulea, Briss. Orn. iv. p. 433.

"Tucana in toto corpore coeruleo et cinereo varia."

"Habitat in Mexico." Brisson, as above.

This is another of the descriptions which Brisson apparently copies from "Eus. Nieremb. pag. 209." and perhaps also somewhat from "Aldrovandus, Orn. 1 p. 803, in qua hujus icon a Nierembergio mutuata." The figure in Aldrovandus probably is intended to represent a bird of this family, but neither it nor his description applies to any known species.

5. RAMPHASTOS DUBIUS, Gm. Syst. Nat. i. p. 357 (1788).
Blue-throated Toucan, Lath. Syn. i. p. 357.

"In a list of birds in the Museum of *Baron de Faugeres* of *Montpelier*, I find one by the name of *Toucan à gorge bleue*, with this addition, 'Ce Toucan n'est decrit par aucun auteur.' I do not find a Toucan with a blue throat mentioned by any writer, and must therefore, with him, conclude it to be a new species. As it is but very lately that I have known this circumstance, it has not been in my power to say further on this head, resting the whole, for the present, on his opinion." Latham, as above, and in Gen. Hist. ii. p. 294, gives the same account of it, in substance. I agree in allowing it to rest for the present, but should the original Baron or other be disposed to stir in the matter he can now be better accommodated.

6. RAMPHASTOS BYRON, Müll. Syst. Nat. Supp. p. 82 (1776).
Buceros albus, Gm. Syst. Nat i. p. 361.

"Captus inter insulas Tinian et Pulotimeon, anseris magnitudine."

A white Toucan, the size of a Goose! I guess not.

7. RAMPHASTOS INDICUS, Miller, Cimelia Physica p. 102 (1796).
Mill. Cym. Phys. pl. 57.

"Ramphastos gula remigibus caudaque nigris, genis pectoreque albis, abdomine femorisque luteis, vertice rubro-aurantio, uropygio phoeniceo." Miller, as above.

Usually cited doubtfully as a synonyme for *R. Toco*, but the plate represents no species at present known, and has the appearance of having been drawn from a made-up or fictitious specimen, the head rather especially.

October 1*st*.

The President, DR. HAYS, in the Chair.

Twenty-three members present.

Dr. Leidy exhibited specimens of black hornstone, a variety of basanite, from the limestone of Easton, Pa., and observed that he had suspected it was of organic origin. Low microscopic power exhibits in this hornstone a composition resembling oolite.

October 8*th*.

MR. VAUX, Vice-President, in the Chair.

Twenty-four members present.

October 15*th*.

The President, DR. HAYS, in the Chair.

Thirty-five members present.

The following was presented for publication:

"Notes on a Collection of Mammals from Arizona." By Elliott Coues, M. D., U. S. A.

Prof. Holmes, of Charleston, exhibited specimens of remains of extinct and recent animals, accompanied by bones of man, together with pottery, stone arrow-heads and hatchets, which he observed were obtained from the post-pliocene strata in the neighborhood of Charleston.

Dr. Wood made some remarks on a fresh-water alga from the thermal springs in Mono Co., Cal., which was said to grow in water having a temperature of from 120°—136° F.

October 22*d*.

The President, DR. HAYS, in the Chair.

Twenty-three members present.

The following papers were presented for publication:

"Notes on a Collection of Californian Myriapoda, with the description of a new Lithobiid from Illinois." By Horatio C. Wood, Jr., M D.

"Note on Geotrygon sylvatica, Gosse." By Richard Hill.

Abstract of a verbal communication to the Academy of Natural Sciences of Philadelphia, 22d Oct., 1867, by Benj. Smith Lyman.

On the Great CARBONIFEROUS CONGLOMERATE in Sullivan County, Pa.

It has been hitherto supposed that the Great Conglomerate, or Formation No. XII, at the bottom of the coal measures, thinned away so rapidly northwestward from a thickness of twelve hundred feet near Mauch Chunk, that it had a thickness of only a hundred feet on the northern edge of the Wyoming Valley, and still less in the First Bituminous Coal Basin north-west of that A recent examination of exposures in the First Bituminous Coal Basin, on the Berwick and Towanda Turnpike, in the eastern part of Sullivan County, some thirty miles north-west of Wilkesbarre, and twenty-five from the nearest anthracite

coal, shows that the Great Conglomerate is really something like four hundred feet thick. It consists here of two beds of pebble rock with white quartz pebbles of the size of chestnuts, each bed perhaps seventy or a hundred feet thick, and of some two hundred feet or more of sand rocks between, that are light brown at the bottom and greenish above, and thin-layered throughout, and resembles closely the sand rocks of the productive coal measures. Some sixty feet from the bottom of the sand rocks is a bed of shaly red iron ore, three or four feet thick, with a six inch layer of rich dark carbonate of iron nine inches above the red ore. Immediately below the lower bed of pebble rock there is more red iron ore and the red shales of No. XI.

At Shinersville, a mile and a half north of the Birch Creek Coal Mines, the top of the lower pebble rock is seen dipping southerly towards that creek quite steeply for that region, say fifteen degrees; and, according to the State Geological Report, the red shales of No. XI. are seen underlying this pebble rock a short distance further north. Even if this dip should grow gentler, as it no doubt does, on approaching the bottom of the basin near Birch Creek, yet this lower puddingstone must pass far below the coal. On the hillside from Shinersville down to Birch Creek no rocks are to be seen in place in the road, but it is plain that the pebble rock is not immediately under the soil, and the ground has upon it a great many blocks of brownish sandstone. On the south side of Birch Creek, near the foot of the hill, two small ledges of this sand rock crop out in the road apparently in place, and apparently below the upper pebble rock. At the Birch Creek Mines the dip is very gentle, northerly. On the hill side just north of the Loyalsock Creek, (which the turnpike crosses at three miles from Shinersville) the outcrop of the upper pebble rock is very conspicuous, but it does not reach to the bottom of the hill. Below it are large blocks of thin-layered light brown sand rock, but none probably quite in place. No red shales seem to be visible now on the turnpike near the Loyalsock on either side, in spite of an allusion in the State Report to such an exposure: nor is the lower pebble rock exposed here; but, according to the State Report, a pebble rock, which must be the lower one, is exposed in the bed of that stream some miles below the crossing of the turnpike. On the south side of the Loyalsock the sand rock is well exposed in the road in many ledges; it is all thin-layered, a little shaly, brownish below and greenish near the top of the hill; and the dip is gentle, northerly. South of the first summit south of the Loyalsock is a slight hollow with ledges of the same sand rock with the same dip on the northern side, and on the top of the next summit to the south bits of red iron ore are exposed in the road with a quantity of blue shaly sand-stone lying near it. On the south side of this second summit from the Loyalsock there is plainly an outcrop of the lower pebble rock. The ground rises gently, with some small hollows here and there for half a mile from the last mentioned summit, and there is exposed a broad flat ledge of pebble rock with a decided but gentle northerly dip (perhaps three degrees) plainly passing under the sand rocks to the north. The whole thickness here of these sand-rocks would seem, at a guess, to be some 200 or 250 feet. Still further south on the turnpike, after passing over the rough outcrop of the lower pebble rock with low cliffs and huge blocks on the north side of Lopus Creek, with a dip of perhaps ten degrees, and again north of Painter Den Run, with a gentle northerly dip, the red shales of XI with iron ore at the top, are clearly exposed to a thickness of perhaps fifty feet on the south side of Spring Brook, about eight miles south of Shinersville; and this brook cuts down even deeper, into a greenish gray sand rock. The lower pebble rock crops out for a mile or so south of these red shales as far as the hill side south of Bear Swamp Run, and lies in great blocks, with here and there a small ledge in place in the road which shows apparently a very gentle southerly dip. South of this appear the sand rocks of Long Pond, that continue along the turnpike for three miles with little or no dip in any direction but much cross-bedded. They are

followed for a mile on the south by the lower pebble rock, which is followed at the brow of the North (or Alleghany) Mountain by the red shales of XI, and these below by a greenish gray sand rock. The sand rocks of Long Pond amount to a thickness of about 190 feet, according to a rough leveling from an exposure of the lower pebble rock, three quarters of a mile south-east of the Pond, to the top of a hill a quarter of a mile north-east of the Pond. The upper seventy feet of these sand rocks are, at least in part, greenish in color, the lower 120 feet are mostly light brown or sometimes white. The iron ore has been proved by digging and boring about sixty feet above the lower pebble rock, and it has about fifteen feet of blue shaly sand rock below it, that grows black towards the bottom, and seems to have true coal slate below it in some places and very dark sand rock for a few feet below that. The lower pebble rock here seems to be some seventy feet thick; some of its layers turn into sand rock in parts; and some thirty feet below the top is an irregular bed of coal slate that varies from nothing up to perhaps eighteen inches in thickness and has sometimes a few inches of coal.

The apparent correspondence of this coal with a thin coal bed within the upper pebble rock, at Birch Creek, and the discovery of the coal slate near the iron ore, and the general close resemblance of the sand rocks to those of the productive coal measures, together with the statements in the State Report of the thickness of the Great Conglemerate in this region, led very naturally to the belief that the pebble rock at Long Pond was the same as the one at Birch Creek, that it was, in fact, the whole of No. XII, and that the sand rocks of Long Pond were those of the productive coal measures, and contained, like those of Birch Creek, a five foot coal bed near the bottom, and a thirteen foot one some fifty-five feet higher up. The lower 150 feet of the Long Pond sand rocks have been, however, pretty thoroughly proved by borings and other exposures to contain no coal bed.

October 29th.

MR CASSIN, Vice-President, in the Chair.

Seventeen members present.

Chas. W. Matthews was elected a member.

On favorable reports of the Committees, the following papers were ordered to be published:

Notes on a Collection of California MYRIAPODA, with the Descriptions of New Eastern Species.

BY HORATIO C. WOOD, JR., M. D.

The California specimens, herein noted, were collected by my friends, Dr. George H. Horn, late Surgeon United States Volunteers, and Mr. William M. Gabb, of the State Geological Survey, who generously gave them to me. It will be noticed that certain species, which were assigned in my monograph to Georgia, are included in the collection. Yet I do not believe that the geographical range of these species is by any means so extensive. All the specimens alluded to as described formerly as natives of Georgia, were collected by Dr. Le Conte. That gentleman informed me, whilst preparing my extended memoir, that he had made collections both in Georgia and California, and presented them to the Academy of Natural Sciences. There was but a single bottle to be found in the cabinet with the doctor's name attached, and that was labelled Georgia; consequently I concluded that the California specimens were missing. There can be no mistake as to the localities assigned to the various species in the present paper, and it seems most probable that Dr. Le Conte's specimens of Californian myriapods were emptied by some

one into the bottle containing the Georgian species, and that such as are herein noted are strictly Californian types.

Gen. MECISTOCEPHALUS.

M. QUADRATUS, n. sp.

M. saturate aurantiacus, venuste politus: capite sparse distincte punctato: antennis sparse pilosis: labio distincte punctato, medio sulcato: mandibulis distincte punctatis, intus denticulis parvis duobus armatis: suturis sterno-episternalibus et scuto-episcutalibus conspicuis: scuto postremo triangulare; pedibus utrinque 51.

The head is rather large. The cephalic segment is slightly narrowed from near the front posteriorly. The punctations, both on the upper and under surface of the head, are mostly arranged in longitudinal series: they are much more numerous on the under surface: there is a transverse row of them on the anterior border of the cephalic segment. The mandibles are furnished, on their inner margin, with two minute distant denticules: upon the labium at their base is a minute black dot. The scuto-episcutal sutures are very distinct, and communicate at their bases so as to leave a central quadrate islet.

Length, about an inch and a half.

Hab.—Los Gatos, Coast Mountains.

Gen. GEOPHILUS.

G. LÆVIS, Wood.

Three specimens from the Santa Cruz Mountains, agreeing in all important characters with Dr. Le Conte's specimens supposed to have been collected in Georgia. The only difference is that there is not, in any of them, a ventral median line: some of them have central sternal indentations, which may be considered rudiments of such a line.

Gen. BOTHROPOLYS.

B. XANTI, Wood.

Specimens from San Jose, California, and Santa Cruz Mountains, agreeing well with published description.

Gen. SCOLOPOCRYPTOPS.

S. SPINICAUDA, Wood.

Specimens from San Jose, agreeing with published description, except that the head is scarcely profoundly punctate, and the scuta not rugous; from Los Gatos Mountains, agreeing well.

Gen. STRIGAMIA.

S. LÆVIPES, Wood.

Specimens from Santa Cruz Mountains and Los Gatos, Coast Mountains, which exhibit no specific differences from the specimens said to have been collected in Georgia by Dr. Le Conte.

S. GRACILIS, sp. nov.

S. saturate olivacea, gracilis, elongata; capite sparse punctato; segmento cephalico elongato; antennis modice longis; labio sparse punctato, medio leviter canaliculato; mandibulis parvis, intus denticulo parvo armatis; scutis nonnihil rugosis; sternis suturis sterno-episternalibus et depressione mediana instructis; pedibus utrinque 96, modice longis.

The body of this geophilid is very long and slender. The head and mandibles are sparsely pilose. The color is dirty olive, approaching a slate: the antennæ are more of an orange. The mandibles are furnished on their inner margin with a single small tooth. The scuta have frequently a somewhat obsolete central depression: they do not have the sutures well marked, but are more or less irregularly wrinkled. The last pair of feet in the single specimen I have seen are large and massive; their coxal joint is not pitted.

Hab.—San Jose.

S. INERMIS, sp. nov.

S. aurantiaca; corpore valde depresso, antico modice angustato; capite modice magno; segmento cephalico triangulare, modice lato; antennis brevibus, submoniliformibus, haud acuminatis; mandibulis parvis, haud denticulatis sternis depressione mediana instructis; pedibus crassis, brevibus, utrinque 115; scutis brevibus sine suturis.

The labium is strongly narrowed posteriorly by the very large basal joint of the mandible encroaching on it. In general appearance this species closely resembles *G. tæniopsis*, Wood, from which it is separated by the wide disparity of the number of joints. The coxæ of last pair of feet are not pitted.

Hab.—Santa Cruz Mountains, California.

Gen. POLYDESMUS.

P. HAYDENIANUS, Wood.

Specimens from the Santa Cruz Mountains, agreeing well with the published description.

P. DISSECTUS, sp. nov.

P. olivaceus?; scuto anale parvo, triangulare; appendicibus masculis maximis; spina terminale magna, robusta, intra pilosa, ultima in spinulis 4 secta.

The specimens which I have seen have either lost their color from long contact with alcohol, or else are individuals which have recently shed their skins. The pattern of coloration is therefore not to be made out with certainty. The lateral laminæ evidently differ in color from the remainder of the scutum. The male genital appendages are large. They are robust and very hairy. The terminal spines are robust, and so placed at right angles to the rest of the part as to be nearly horizontal and anteriorly divergent. They are furnished on their inner surface with numerous long rigid hairs. Each spine in its distal third is divided into two parts, and the upper of these (the one nearest the body) consists of a short, robust, curved process, which is opposed to the lower part much as the thumb is to the fingers. The lower division is much the larger, and is terminated by a short, inconspicuous, blunt process and three spines; of the latter, the lowermost is broad, thin, obtuse, and as it were twisted on itself; the other two are sub-cylindrical, acute and simply curved, the larger of them is slightly sabre-shaped.

This species belongs in the group *Fontaria*.

Hab.—Fort Tejon.

Gen SPIROBOLUS.

S. UNCIGERUS, Wood.

A number of specimens, agreeing well with the published description, excepting that they are much darker in color.

Hab.—San Jose, Fort Tejon.

Gen. JULUS.

J. OREGONENSIS, Wood.

Hab.—Fort Tejon, San Jose.

Gen. CRYPTOPS.

C. ASPERIPES, sp. nov.

C. aurantiacus; antennis 19 articulatis; pedibus postremis dilute aurantiacis, modice robustis, longissimis, spinulis acutis nigris numerossimis armatis; appendicibus analibus lateralibus truncatis, profunde punctatis, spinulis paucis instructis.

Long., unc I.

The color of this strange little animal is orange, mostly somewhat deeper on the head and lighter on the feet. The labium is convex, rather short, and edentate. The mandibles very long. The cephalic segment has a dark, more or less concentric marking. The scuto-episcutal sutures are well marked, and there is in many specimens a central line. The antennæ have 19 joints each,

and the latter are so short and broad that they are almost moniliform. The hindmost two or three pairs of feet are roughened by small black acute spines, which are especially pronounced on their femora and tibiæ. The last pair are very much longer than any of the others and, when preserved in alcohol, the last three joints are bent into the form of a triangle, so that the terminal claw rests on the tibiæ-tarsal articulation, pointing inwards; the femora and tibiæ are almost covered with the very numerous black spines. In most specimens there is a sharp black spinule on the upper posterior angle of the lateral anal appendages. I am indebted to Prof. Leidy for my specimens of this species. He caught them in the woods on the Alleghanies of Montgomery County, Virginia.

Gen. LITHOBIUS.

L. BILABIATUS, sp. nov.

L. brunneus; segmento cephalico sparse leviter punctato, late subcordato, margine postico elevato; antennis modice longis, nonnihil pubescentibus; ocellis utrinque 13; labio antice producto, sine laminis dentalibus distinctis, cum lateribus sejunctis usque ad basem; dentibus sejunctis 4—6; scutorum marginibus posticis rectis, angulis haud productis; pedum pare postremo in mare magno, processibus magnis duobus utrinque armato.

The general color of this species is a dark brown, with the labium and feet lighter, somewhat approaching ferruginous. In the male the last segment with its appendages is much lighter than the rest of the body. The cephalic segment is very broad in the male, much broader than the anterior portion of the body. The labium is produced forward in such a way that there are no distinct dental laminæ. The two halves are separated or merely joined by a membrane almost to their base. Anteriorly they are very close to one another, but then separate so as to make an elliptical opening closed by a thin membrane and a little ligula-like process projecting on the superior portion. The styliform appendages of the anal segment appear to be wanting in the male. The margins of the scuta are remarkably straight, the angles generally rounded, so that they are not all emarginate. The feet generally are robust and somewhat compressed. In the male the hindmost ones are very large, the coxæ short, the thigh short with the distal internal angle prolonged into a well-pronounced process surmounted by numerous spines; the next joint is large, with a long, robust, curved process projecting inwards from its proximal third, and also a small, nearly cylindrical one on its distal inner angle.

In the female the next to last pair of feet is larger than those anterior to it; the last pair long, cylindrical, still larger, without processes, but with numerous spines on the enlarged distal end of the thigh. I am indebted to the well-known entomologist, Mr. Walsh, of Rock Island, Illinois, for a male and female of this species, by whom they were captured in the vicinity of his home.

Length, ¾ an inch.

Note on GEOTRYGON SYLVATICA, Gosse.

BY RICHARD HILL.

(Communicated by Thomas Bland, New York.)

Spanish Town, Jamaica, 7th June, 1867.

To THOMAS BLAND, ESQ.:

My Dear Sir:—In examining, the other day, our large ground dove, found only in solitary places in our mountain forests, (the bird familiar to you by the name of the mountain witch, but so named less from the beauty of its coloring than from its mysterious movements—moaning in the underwood,) it struck me that, in habits and contour, it had an apparent relation to the extinct *Dodo*, the *Didus ineptus* of naturalists. A careful examination of the only remains of the Dodo,—the head and foot in the British Museum,—establishes

that it was one of the Columbidæ. Our mountain ground dove is the *Geotrygon sylvatica* of Gosse. Its habits are solitary; it is of a thick, heavy form; seldom seen on the wing; feeds on the ground, and has a moaning coo.

The *Geotrygon sylvatica* varies in plumage from light bright tints to a sombre blending of bronze and claret-purple. It is drab colored on the head, varying from blue to dull yellow. The feathers fall into a kind of hood, and the plumage of the breast to the legs is edged so as to appear scaled. A scaled feathering prevails in all the under plumage. It resembles in this peculiarity the *Carpophaga* of Eastern Australia; a style of feathering rare in doves, but characterizing the Dodo. Our bird is such a lover of solitude that it is seldom seen; few know its habits, beyond the lonely moaning and the uncertain movements that render the tracing of it difficult in the forest.

Our bird is the largest of our doves; as big as a pullet. The bill has considerable curvature and fleshiness, large and strong. It would be easy, by studied exaggeration of the rounded heavy contour, with the pigeon beak, and the dumpy goose-shape, to make out the Dodo-form, between the figures of Bontius and Leguat. We have only to elevate it into its habitual stride, and we have the stateliness and grace in Leguat's description of the solitary bird of the Island of Rodrigo. That description is just our mountain-witch, grown to the size of a turkey.

Our bird is noticeable for its rasorial scratching, if that habit be correctly reported. It is said to take in occasionally such molluscous food as the snail, with the eggs of termites. Mr. Gosse's information relative to mollusks is very precise. He detected the snail among the contents of its craw. This is a great deviation from the pigeon character. Pigeon food only varies from grain by the occasional mixture of the young shoots of such succulent herbage as turnip tops.

Sir Hans Sloane has in his manuscript notes an observation made by L'Estrange on the living Dodo. It is introduced as an annotation by Wilkins in Pickering's edition of Sir Thomas Brown's "Vulgar Errors." "About 1638 as I walked London streets I saw the picture of a strange fowle hong out upon a cloth, ———vas* and myselfe with one or two more Gent, in company went in to see it. It was kept in a chamber, and was a great fowle somewhat bigger than the largest Turkey Cock and so legged and footed, but stouter and thicker, and of a more erect shape, coloured before like the breast of a young cock Fisan (pheasant) and on the back of dunn or deare colour. The keeper called it a Dodo and in the ende of a chimney in the chamber there lay a heape of large pebblestones whereof hee gave it many in our sight, some as big as nutmegs."

Yours, &c., RICHARD HILL.

November 5th.

The President, DR. HAYS, in the Chair.

Thirty-two members present.

Prof. E. D. Cope presented to the Academy specimens of four extinct species of Mammalia, which were discovered by Jas. T. Thomas, in the Miocene deposits of the Yorktown epoch in Charles Co., Maryland.

The first was a species of the genus Eschrichtius, to which the recent humpback whale is allied, of a species not previously known. It was called E. CEPHALUS Cope. The remains preserved were a considerable portion of the muzzle, both rami of the mandible, several vertebrae, and a considerable number of pieces of the hand, with ulna, humerus, etc. Other specimens, previously presented to the Academy, probably belonging to the same species, were some cervical and dorsal vertebræ, portions of cranium and os petrosum

* The name is in part erased, perhaps it was Gervas, for Gervas Hollis, the antiquary.

from Yorktown, Va., and os petrosum from Tarboro', N. Ca. The mandibular rami measured 9 ft. 4 in. and were referred to an individual 31 ft. long. They were compressed, and with a narrow superior ridge, without nutritive foramina. The hitherto known Miocene Whales—Balaena p r i s c a and B. p a l a e a t l a n t i c a of Leidy—founded on portions of the mandibular rami, were much less compressed, were furnished with numerous marginal nutritive foramina, and the B. p r i s c a was without superior ridge. The anterior cervical vertebræ were transverse quadrate. The arms were much shorter relatively than the recent M. l o n g i m a n a and M. o s p h y i a of the American coast. Mandible with a low coronoid process.

The second, named RHABDOSTEUS LATIRADIX Cope, was a peculiar genus near the Delphinidæ, allied to Priscodelphinus Leidy, and perhaps Platanista of the Ganges. Characteristic of it was a muzzle formed of the usual elements but entirely cylindrical, the alveolar series approximated underneath, and ceasing near the middle. Beyond this the muzzle was prolonged like a cylindrical beak of a sword fish, or Coelorhynchus, and probably much farther than the mandible. Alveolæ longitudinal fragmentary specimens of this muzzle had been found by the discoverer 2·5 feet in length.

Thirdly, a fragment of the muzzle, including the proximal portions of the maxillary bones, with molars, and the canine teeth of the SQUALODON ATLANTICUS (Leidy). As the Miocene representative of the larger species of the Eocene period, it was shown to possess a close affinity to the Miocene Squalodon g r a t e l o u p i i (Gerv.) of Malta and France. The double serration of the molars and their deeply divided compressed fangs were features in which it differed from its congener.

SQUALODON MENTO Cope was characterized from four molar teeth, which were between two and three time as large as those belonging to the Squalodon w y m a n i i (*Phoca* of Leidy) with similar short incurved crowns, but much more rugose. One molar had a smooth compressed fang, which was little curved and with groove on each side. The fangs of the others were weathered, not grooved, curved and acute.

November 12th.

The President, DR. HAYS, in the Chair.

Thirty-two members present.

The following was presented for publication:

An addition to the Vertebrate Fauna of the Miocene Period of the United States. By Edward D. Cope.

The death of Prof. Michael Faraday, correspondent, was announced.

Dr. Le Conte made remarks, illustrated by specimens, upon the tertiary coal-beds of New Mexico, in the vicinity of the Rocky Mountains, and upon the cretaceous coal-beds of the Rio Grande Valley. Both regions were regarded by him as capable of supplying abundant fuel for railroads, metallurgic and manufacturing purposes. He also mentioned beds of lignite coal, in the vicinity of Denver, of great thickness—from 11 to 16 feet—free from impurities.

November 19th.

The President, DR. HAYS, in the Chair.

Thirty-four members present.

November 26th.

The President, DR. HAYS, in the Chair.

Thirty-three members present.

The following gentlemen were elected Correspondents:

Mr. W. S. Bingham, of Boston; Prof. O. Root, of Utica, N. Y., and Col. E. Jewett, of Utica, N. Y.

The following were elected Members:

Messrs. Edw. R. Murphy, Lloyd P. Smith, F. A. Hassler, G. Y. Shoemaker and Matthew Newkirk.

On favorable report of the Committee, the following paper was ordered to be published:

Notes on a Collection of MAMMALS from Arizona.

BY ELLIOTT COUES, M. D., U. S. A.

Circumstances have unavoidably delayed, until now, the preparation of the present article, needed to complete the record of the zoological collections made by the writer in Arizona during 1864 and 1865. Articles upon the Coleoptera, by Dr. J. L. Le Conte; upon the Batrachia and Reptilia, by Prof. E. D. Cope; upon the Cheiroptera, by Dr. H. Allen; and upon the Birds, by the present writer, have already appeared in these Proceedings. The few fishes collected were unfortunately destroyed in transitu. The plants, collected jointly by Dr. E. Palmer and the writer, still remain in the hands of Dr. Geo. Engelmann, of St. Louis, to whom they were transmitted for examination and identification. These collections, taken together, may be considered to represent, in a measure, the more prominent features of the fauna and flora of the Territory.

The classification and nomenclature here adopted is that of Prof. Baird's "Mammals of North America" (Pacific Railroad Report, vol. viii.) A general sketch of the Quadrupeds of Arizona, by the present writer, has already appeared in the "American Naturalist," vol. i., Nos. 6, 7, 8 and 10.

CHEIROPTERA.

VESPERTILIONIDÆ.

1. VESPERTILIO SUBULATUS, Say.
Several specimens. An abundant and generally distributed species.

2. VESPERTILIO MACROPUS, n. s., Allen, Pr. A. N. S., Phila., Aug., 1866, p. 288.
One specimen, Colorado Desert, near Fort Mojave; taken in broad daylight, as it was capturing insects over a small pool.

3. ANTROZOUS PALLIDUS (Le Conte), Allen.
Several specimens. An abundant species in the Colorado Valley and southern portions of the Territory; particularly numerous at Fort Yuma.

Other species of this family, found in Arizona, according to Dr. Allen, are: *Lasiurus cinereus, Vespertilio lucifugus, V. evotis, V. nitidus,* and *Corynorhinus macrotis.*

CARNIVORA.

FELIDÆ.

4. FELIS CONCOLOR, Linn.
One specimen, a fine hunters' skin, measuring 6½ feet from tip to tip. This animal is generally distributed, but of rather unfrequent occurrence.

5. LYNX RUFUS, Rafinesque, var. *maculatus*.

Several specimens. Of frequent occurrence, particularly in the vicinity of Fort Whipple.

CANIDÆ.

6. CANIS LATRANS, Say. (*C. frustror*, Woodhouse.)

Numerous specimens. The most abundant of the larger mammals of the Territory, and very generally distributed. It is particularly numerous in the vicinity of the settlements, and very annoying. Numbers may be readily destroyed by poison, as is frequently done. The pelage in winter is fuller and softer than in summer, and chiefly black and grayish-white, losing the tawny and rufous which it has in the latter season. Reproduction occurs in May or June, five or six young being ordinarily brought forth, in rocky, secluded places. The species is frequently precluded from indulging its carnivorous tastes, and compelled to subsist, in great measure, upon fruits and berries.

7. CANIS OCCIDENTALIS, Rich., var. *griseo-albus*.

Several specimens, taken at Fort Whipple in winter, are referrible to this variety. The skins make very beautiful robes. No black or tawny individuals were observed. The species is generally distributed over the Territory, though by no means so abundant as the preceding.

8. VULPES VIRGINIANUS, Richardson.

Three examples. The species is of common occurrence. No red foxes were met with. *V. macrourus* and *V. velox* may possibly be found in the Territory.

URSIDÆ.

9. URSUS HORRIBILIS, Ord.

One specimen, a quarter-grown cub, killed with its dam in the San Francisco Mountains. The species is of common occurrence in that locality.

RODENTIA.

SCIURIDÆ.

10. SCIURUS ABERTII, Woodhouse.

S. dorsalis, Woodhouse. (Pre-occupied.)

S. castanonotus, Baird. (Without ear-tufts.)

Three specimens, San Francisco Mountains. A large and very beautiful species, abundant, and a characteristic of the pine-covered mountainous portions of the Territory.

11. SCIURUS ARIZONENSIS, n. s., Coues, Am. Naturalist, i., 1867, p. 357.

One specimen, Fort Whipple, Dec. 20, 1865; type of the species as described l. c. No other examples met with. A gray squirrel, resembling the common Eastern species, but smaller, the tail longer and broader, and distinctly tricolor below.

In addition to the two preceding species *S. Frémontii*, Aud. and Bach., is believed to occur; and *S. jorsor*, Peale, from California, may possibly reach the Colorado Valley.

12. TAMIAS DORSALIS, Baird.

Numerous examples. An abundant species throughout the Territory. Closely allied to, but readily distinguishable from the other recognized species. It lives chiefly, or wholly, in rocky, broken localities.

13. SPERMOPHILUS BERCHEYI, Cuvier.

Two examples. This species ranges into Arizona from California, but is there by no means so abundant as in the last mentioned region, where, in a measure, it represents the prairie dog of the plains, both in numbers and in habits, and proves a great pest to the farmers.

Other Arizonian *Spermophili* are: *S. grammurus*, Say, in the southern portions; *S. tereticauda*, Baird, in the lower Colorado Valley; *S. Harrisii*, Aud. and Bach.; and probably also *S. lateralis*, *spilosoma*, *Mexicana*.

14. CYNOMYS GUNNISONII, Baird.
One specimen, taken near the San Francisco Mountains, July, 1864. This rare species was there found living in colonies like those of *C. ludovicianus*, only of smaller extent. The general habits of the two appeared very similar.

15. CASTOR CANADENSIS, Kuhl.
Although no specimens of this animal were actually collected, it was frequently seen, and is included here for the purpose of remarking upon its great abundance on nearly all the streams of the interior of the Territory. Its present numbers are doubtless owing to the fact that, of late years, it has been but little, if at all, molested by trappers, whom Indian hostilities have prevented from penetrating to its haunts.

SACCOMYIDÆ.

16. THOMOMYS FULVUS (Woodh.) Baird.
Two specimens, Fort Whipple. The most abundant and characteristic species of the subfamily Geomyinæ, and generally distributed over northern and central Arizona. It is almost wholly subterranean and nocturnal in habit. The small piles of soft, moist earth, seen all over the fertile grassy portions of the Territory, are thrown up by this animal in digging or extending its burrows; and are particularly numerous in the vicinity of clumps of oak. Two other species, *T. bulbivorus* and *T. umbrinus* probably occur in southern and western Arizona.

17. DIPODOMYS ORDII, Woodhouse.
Numerous specimens of this very abundant animal, the "kangaroo rat" of the inhabitants; from Fort Whipple and vicinity. This species seems susceptible of a semi-domestication, like the true *Mures;* and, together with a species of *Hesperomys*, is very common in the storehouses and granaries of Prescott and Fort Whipple, where they readily produce their young. Ordinarily it lives in brush heaps, under fallen logs, etc., as well as under ground. The young are brought forth in May and June; but two or more litters may be produced, especially when the animals are living in places protected from the weather. The young are at first nearly gray, showing little of the clear fawn of the adults. The ordinary mode of progression with these animals is the same as that of other small rodents; but the movements upon all-fours are changed to a series of vigorous leaps when the animals are alarmed.

18. PEROGNATHUS FLAVUS, Baird.
One specimen (Fort Whipple) of this rare and diminutive rodent. Two other species, *P parvus* and *P. penicillatus*, also occur.

MURIDÆ.

MURINÆ. (*Sigmodontes.*)

19. HESPEROMYS EREMICUS, Baird.
Numerous specimens, both old and young, determined to be this species by Prof. Baird. It is the characteristic species of the vicinity of Fort Whipple, where it is semi-domesticated, and, in a measure, plays the part of the house mouse, living and breeding in numbers in buildings. Several other closely allied species of this difficult genus probably also occur, as well as one or two of the genus *Reithrodon*.

20. NEOTOMA MEXICANA, Baird.
Several examples. A very common species throughout the Territory, living indifferently under ground or rocks, in brush heaps, or in low scrubby trees. It is an important article of food with the Indians.

Among the true *Mures*, or "Old World rats," two species have been imported into the settlements along the Colorado River, *Mus decumanus* and *M. musculus*. Apparently, however, they have as yet hardly penetrated to the interior of the Territory.

ARVICOLINÆ.

21. ARVICOLA ——?

Fragments of an undetermined species, taken from the stomach of a large hawk, shot at Whipple. The genus appears to be very poorly represented in the number of its individuals as well as of its species.

22. FIBER ZIBETHICUS, Cuvier.

Skins, sewn together to make arrow-cases, taken from the Apaché Indians. The species seems to be common on some of the waters of the Territory.

LEPORIDÆ.

23. LEPUS CALLOTIS, Wagler.

Three specimens, Fort Whipple. The "jackass rabbit," as the species is called, is very abundant throughout the Territory. Believed to be the only large hare ascertained to inhabit the Territory, though the occurrence of one or two other species, particularly *L. Californicus*, may be anticipated.

24. LEPUS ARTEMISIA, Bachman.

One specimen, Beall's Springs, Western Arizona. A very abundant species throughout the Territory. In the northern portions, at least, it changes its pelage somewhat in winter, losing in great measure the tawny or fulvous, and becoming of a grayish hue, with some parts nearly white. Such a change has not been observed to take place with *L. callotis*.

25. ERETHIZON EPIXANTHUS, Brandt.

One specimen, from the Colorado Chiquito, a locality where the species seems to be particularly abundant.

RUMINANTIA.

CERVIDÆ.

26. CERVUS MACROTIS, Say.

One skin of a doe, taken in October, when the summer coat has been replaced by that of winter. The latter is thicker and fuller, and of a much more uniform mouse-gray. At this season the antlers of the males are well-grown. They differ in some essential points from those of *C. virginianus*. These deer inhabit the open woods and chapparal. A second species, known to hunters as the "white-tailed deer," occurs, but rarely. The black-tailed still continues to be very abundant in all situations suited to its habits: and its flesh and hide are important items in the domestic economy of both settlers and Indians.

27. ANTILOCAPRA AMERICANA, Ord.

Several pairs of horns, and skins of the head, stuffed by the Indians to be used as decoys. Both the present species and the black-tailed deer are hunted by the Indians by this means. One pair of horns, taken near Fort Whipple, are remarkable for the great breadth of the prong, which springs from the extreme base of the shaft, and for the unusual degree of apical curvature of the latter; the tip being bent over until it points directly toward the base of the horn, and its axis is brought quite parallel with that of the upright portion. The antelope is still common on all the open plains of the central and northern portions.

28. OVIS MONTANA, Cuvier.

Horns of this species were often met with about the bases of cliffs and precipices. The animal appears to be much less abundant now than formerly, and only inhabits the most rugged and inaccessible mountainous regions.

The buffalo (*Bison americanus*,) which formerly inhabited the Territory, has for many years been quite extinct.

December 3d.

The President, DR. HAYS, in the Chair.

Thirty-five members present.

Dr. H. Allen exhibited ten crania from the Morton collection, in which was seen the tertiary occipital condyle. This was situated in each instance upon the anterior border of the foramen magnum, was elevated, and more or less circular. It was thought the "condyle" (i. e. facet) was the result of the odontoid process of the axis extending higher, as well as the basilar process being thicker than usual. These conclusions were born out by the examination of a number of axes, in position, as well as disarticulated. In the former it was seen that the superior fasiculus of the transverse ligament often brought the apex of the process in relation to the occipital bone, even when no facet was formed; in the latter several specimens of the isolated bone had been secured, showing two distinct facets upon the odontoid process—the inferior one for the articulation with the atlas,—the superior for the "tertiary condyle."

The following are the measurements of the most conspicuous facets:

996. The facet is 13 m. wide, 8 long, with irregular but well defined borders; the anterior wall is 4 m. high; asymmetrical,—the greatest portion to the left side of the median line. The right border is furnished with anodule at its posterior part. The superior surface of the basilar process is furnished with a small spicule of bone.

631. Facet 11 m. wide, 7 m. long, slightly depressed, a little fuller upon the right than left side; asymmetrical, the greater portion to the right side of median line. The condyles are large with transverse constriction.

1436. 8 m. wide, 8 long, slightly depressed. The left side has appended to its posterior part a sharply defined horn, which is curved forwards upon itself; asymmetrical—almost entirely to right side of median line. Upon either side of facet and immediately in front of the occipital condyle are placed two rounded nodules, the right of which is the larger. Condyle not constricted.

1460. 13 m. wide, 9 long, sides regular, anterior portion slightly elevated; a large spicula, 5 m. long, extending from superior portion of basilar process downwards; facet placed a little to the right side.

93. 5 m. wide, 3 m. long—not depressed—walls not elevated, yet the whole facet stands slightly above the level of the bone placed in median line. The occipital condyles are of unequal size. The left is 24 m. long and 14 m. wide at largest diameter. The right is 30 m. long, 14 wide at largest diameter, while the anterior portion is much more slender than that of the opposite side, running in advance of the facet; facet in median line.

569. The posterior part of the basi-occipital process 6 m. thick, has towards its inferior surface a small circular depression measuring 5 m. × 5 m., defined by a sharp edge which is better marked in front than elsewhere. The entire facet is to the left of the median line and entirely free from the posterior border. A smaller depression, having a diameter of 2½ m., is placed upon the right side upon anterior edge of the free basi-occipital border.

December 10th.

The President, DR. HAYS, in the Chair.

Thirty members present.

Prof. E. D. Cope made some remarks on the contents of caves which abound in South-western Virginia. He stated that bones of all the recent mammalia of the country, including those of the Indians, were to be found in them, and

that the process of deposit was continually going on. He mentioned his discovery of the remains of the floor deposit of one or more extensive caves in the limestone ridge in Wythe Co., Va., which produces largely the ores of lead and zinc. The roof and one side of the caves had been torn away subsequent to the period of deposit of the floor. The latter was of postpliocene age, and contained remains of mammals, birds, reptiles, amphibians, fishes and molluscs chiefly terrestrial. Among the first were tapir, peccary, deer, horse, small carnivora, shrews and several rodents; together, sixteen species. The deposit extended eight miles in length.

He also announced the existence of a postpliocene deposit in Charles Co., Maryland, near the Patuxent river, as indicated by the remains of the common peccary, a Manatus and a new carnivore of the genus Galera.

December 17th.

The President, DR. HAYS, in the Chair.

Twenty-three members present.

December 24th.

The President, DR. HAYS, in the Chair.

Sixteen members present.

The following papers were presented for publication:

"A Review of the species of Amblystoma." By E. D. Cope.

"On the Genera of fresh-water Fishes Hypsilepis, Baird, and Photogenis, Cope, their species and distribution." By E. D. Cope.

"On the Distribution of fresh-water Fishes in the Alleghany Region of south-western Virginia." By E. D. Cope.

"Fasti Ornithologiæ." No. III. By John Cassin.

The deaths of the following members were announced: Mr. Jacob Pierce and Mr. Richard M. Marshall; also Dr. Chas. Zimmerman and Rev. Dr. C. Dewey, Correspondents.

December 31st.

MR. VAUX, Vice-President, in the Chair.

Twenty-seven members present.

On favorable reports of the Committees, the following papers were ordered to be published:

An addition to the VERTEBRATE FAUNA of the Miocene period, with a synopsis of the extinct CETACEA of the United States.

BY E. D. COPE.

The species below enumerated were collected by James T. Thomas near his residence in Charles county, Maryland, not far from the Patuxent river, in the beds of the Yorktown epoch, in places where they are exposed by the cutting of various streams. The localities are twenty miles to the eastward of the outcrop of the eocene beds, and as those of the pliocene are at a considerable distance eastward of the eastern shore of the Chesapeake Bay, it is scarcely probable that there is any admixture of specimens from those formations. Two species in the collection of *Galera* and *Dasypus* genera at present existing in South America,—the latter within our own limits also,—indicate the existence

of a post-pliocene deposit in the neighborhood, which has not been hitherto recognized.

In the miocene region, the beds of shells are of considerable thickness, and are composed of immense numbers of closely packed individuals of many species, in a very good state of preservation. They are, however, less silicified, and therefore more friable than those of the great beds at Yorktown.

The before-mentioned collection, which is now in the museum of the Academy, contained the following species of molluscs, etc., for the identification of which I am indebted to my friend T. A. Conrad:

Madrepora palmata *Goldf.*,
Orbicula lugubris,
Ostrea trachydiscus, *Con.*, sp. nov.,
Ostrea thomasii, *Con.*, sp. nov.,
Anomia multilineata,
Chama corticosa,
Isognomon tortum,
Pinna,
Pecten madisonius,
Pecten jeffersonius,
Pecten humphreysii,
Pecten marylandicus,
Pecten clintonius,
Pecten virginianus,
Pecten cerinus, *Con.*, sp. nov.,
Axinæa lentiformis,
Arca callipleura,
Arca improcera,
Noëtia carolinensis,
Corbula idonea,
Corbula pectorosa, *Con.*, sp. nov.,
Cardium laqueatum,
Isocardia markoii,
Isocardia fraterna,
Crasatella undulata,
Crasatella melina,
Crasatella marylandica,
Cyclocardia granulata,
Carditamera protracta,
Astarte exaltata,
Astarte undulata,
Astarte cuneiformis,
Astarte perplana,
Mercenaria staminea,
Mercenaria cuneata, *Con.*, sp. nov.,
Lucina americana,
Lucina foremani,
Lucina contracta,
Dosinia acetabulum,
Dione staminea,
Dione marilandica,
Pliorhytis centenaria,
Sphærula subvexa,
Metis biplicata,
Glycimeris americanus,
Fissurella redimicula,
Zizyphinus bryanii, *Con.*, sp. nov.,
Lunatia catenoides,
Scala pachypleura, *C.*,
Turritella indenta, *C.*,
Turritella alticostata,
Ecphora quadricostata,
Bursa centrosa, *Con.*, sp. nov.,
Balanus vulcanellus, *Con.*, sp. nov.,
Balanus proteus.

ELASMOBRANCHI.

AËTOBATIS, Müll., Henle.

AETOBATIS ARCUATUS, Agassiz, Poiss. Foss. iii. Gervais, Palæont. Francaise, Tab.

This species, figured by Gervais, has existed in abundance during the period of deposit of the miocene beds. Two or three other species of the genus have left their remains in the same, which will be characterized at some future time.

AETOBATIS PROFUNDUS Cope, sp. nov.

This species is represented by numerous separated plates of the inferior dental series. They are therefore curved, and attached to their laminiform roots at a strong angle. The species was smaller than the preceding, judging by the portions preserved. The band-like teeth differ in their masticatory surfa being convex or rounded, not plane, and having a much less projecting r lip-like convex margin. Their curvature is less, and does not approach angulation of the A. a r c u a t u s, and the width is nearly uniform at all r and not narrowed at the extremities as in the latter. The laminar po relatively longer, having therefore a more extensive imbrication.

	Lines.
Length of convexity of perfect tooth	21·5
" of chord " "	16·75
Depth of laminar series	6
Width of masticatory surface	2·75

MYLIOBATIS Cuvier.

The following are the first species of this genus which have been determined from the miocene age in the United States:

MYLIOBATIS GIGAS Cope.

This species is remarkable for the transverse extent of its median teeth, and its strong antero-posterior curvature. The latter is greater than the transverse curvature, which consists in the slope of the lateral dental series and of the extremities of the median teeth. Lateral teeth longer than broad, convex, in two rows. Median teeth well arched horizontally, but straight in their median portions, the length one-seventh the (straight) width.

Total length 3 in. 8 lines; width of median series 3 in. 2·5 lines. Sutures straight; surface smooth. (Remains of two or three individuals in the collection.) Should the proportions of this species have been similar to those of the M. aquila of the Mediterranean, the extent of its pectoral fins would have been not less than nine feet.

MYLIOBATIS PACHYODON Cope.

This species, also of large size, approaches near to the M. holmesii Gibbes, and M. regli anus Agassiz. It differs from the former in its median series of teeth being transverse and scarcely curved, and in the inferior laminæ being without V-like grooves; and from the latter in the depth of median teeth being half deeper in relation to the length, and in their greater transverse convexity. The specimen on which the species is founded consists of the lateral portions of four median and the single row of lateral teeth. The great depth of the vaso-dentinal layer is only equalled in the M. holmesii. The M. stokesii Agass. and M. micropleurus Agass., which resemble it in some particulars, differ in possessing two lateral series of teeth.

The lateral teeth are larger than broad.

	Lines.
Longitudinal width of median tooth band	5 25
Depth of vaso-dentinal layer	7·75
" of lamellar layer	2·75

The transverse extent of the plate to a point which appears by the inferior curvature to be the middle, is 16 lines; the series has therefore probably been narrow.

MYLIOBATIS VICOMICANUS Cope.

Specimens of two individuals represent this species, which is of somewhat smaller dimensions than the two preceding, though one of the large species. One plate, extending over twelve median teeth, is flat antero-posteriorly, and nearly so transversely: the sutures of the median teeth slightly concave medially, and strongly convex at their extremities. Two lateral rows of teeth, which are longer than broad. Sutures straight. Vaso-dentinal layer shallow: where worn down in an old specimen, the surface is punctate all over through the section of the vascular canals.

	In.	Lin.
Total length of specimen	3	2·5
Transverse length of median teeth	2	3·75
Length of median teeth		3·75
Depth of vaso-dentinal stratum		4·5

In the preceding three species the series of attaching laminæ are arranged in series oblique to the base of each tooth.

RAJA Linnæus.

RAJA DUX Cope.

This species is represented by a dermal plate, which was originally covered by enamel, and probably supported a spine; the latter, and a considerable portion of the former, have been lost. The form is unsymmetrically subpentagonal, longer than broad. One extremity truncate, the other obtusely narrowed. Inferior surface concave flattened; superior rising to a small median plane, edges thin. Greatest elevation near the narrow extremity, where the spine stood; a groove extends from the position of the latter to the margin. Surface indistinctly ribbed at right angles to the margin. Enamel with slightly wavy ribs, those near the centre much coarser than those near the circumference. Length of plate 15 lines; greatest width 12·75 lines; greatest depth 4 lines. A second plate, perhaps of the same species, differs in its narrower form; it is without enamel.

This ray was larger than any described from European tertiary.

NOTIDANUS Cuv.

NOTIDANUS PRIMIGENIUS Agassiz, Gibbes.

Fourteen teeth.

NOTIDANUS PLECTRODON Cope, sp. nov.

This species is represented by nine teeth, which are quite characteristic. It presents fewer denticles than any other species, and thus approaches distantly the N. recurvus of Agassiz. Large denticles but two, leaning obliquely in the plane of the root; the external denticle one-fifth the size of the median. Median denticle twice as high as broad at the basis, little inclined from the plane of the root; the cutting edge curved. Serrate edge very short, basal, in one specimen with no, in another four denticles. Section of root wedge-shaped.

	Lines.
Length of root	8·75
Elevation of longest denticle	6

Four teeth which I refer to a median position in the jaws of this species, have no lateral cusps whatever, but approximate those of some species of Lamna in form. Crown rather slender, subcylindric and slightly constricted at the base of the enamel, which is convex vertically and transversely at that point. This convexity is very strong to the apex of the tooth; the other side is still more convex. The crown is also very oblique in one or both directions. It is perfectly smooth, with lateral cutting edges. The latter disappears on the inner basis of the largest and most curved specimen. The enamel does not descend low on the outer face in the largest specimens. Tip little compressed; narrowed. Greatest length, 8·25 l.; of crown, 6·25; of root transversely, 6 l.

GALEOCERDO Müll., Henle.

GALEOCERDO APPENDICULATUS Agass.

GALEOCERDO LATIDENS Agass.

GALEOCERDO ADUNCUS Agassiz.

GALEOCERDO CONTORTUS Gibbes.

GALEOCERDO EGERTONI Agass.

GALEOCERDO ? sp. aff. contorto.

GALEOCERDO LÆVISSIMUS Cope, sp. nov.

This species is indicated by a large number of teeth. It is of the type of G. aduncus, but is characterized by the shortness of the root transversely as compared with the elevation of the crown, the convexity of the inner face of the latter, and the total absence of denticulations in any portion. The crown is oblique, the inner margin vertical in nearly all the specimens, the basal cut-

ting edges short. The upper margin is not turned outwards, as in G. contortus Gibbes, and the section of both inner and outer faces everywhere convex. Base of the enamel inside either convex or plane; outer basis rising on the crown. Axis of medium spec. 5·25 l. Transverse extent of same, 6·75 l.

The apex of the crown is not nearly so oblique as in G. aduncus, though the specimens are, as in other species, more or less oblique or depressed, according to the position in the mouth. The species appears to be well marked.

SPHYRNA Rafin.

SPHYRNA PRISCA Agass.

SPHYRNA ? spec.

SPHYRNA MAGNA Cope.

This species resembles in its dentition a small Oxyrhina, with the basal portion much prolonged laterally, and crenate. The crown in the specimens is slightly to markedly oblique, rather narrow and stout, slightly bent outwards, with sharp, and entirely smooth cutting edges. Both faces are convex, the outer much so, the inner with a slight groove at base. The root rather short, slightly concave below, and prominent behind. The basal portion bounding the least angle is separated by an incised notch. One specimen is larger, more oblique, and with longer basis. Total elevation of medium specimen 7 lines: basis of same 6·5 lines. Larger specimen, axis, 7·8 lines; basis, 9 lines.

HEMIPRISTIS Agass.

HEMIPRISTIS SERRA Agass.

CARCHARODON Smith.

CARCHARODON ? ANGUSTIDENS Agass.

CARCHARODON MEGALODON Agass.

OTODUS Agass.

OTODUS OBLIQUUS Agass.

OTODUS APPENDICULATUS Agass.

OXYRHINA Agass.

OXYRHINA XIPHODON Agass.

OXYRHINA HASTALIS Agass.

OXYRHINA DESORII Gibbes.

OXYRHINA SILLIMANII Gibbes.

OXYRHINA MINUTA Agass.

LAMNA Cuvier.

LAMNA HOPEI Agass.

LAMNA DENTICULATA Agass.

LAMNA ELEGANS Agass.

LAMNA CUSPIDATA Agass.

LAMNA ? SUBULATA Agass.

TELEOSTEI.

SPHYRÆNA Cuv.

SPHYRÆNA SPECIOSA Leidy, Proc. Acad. Nat. Sci. 1856. p. 221.

TESTUDINATA.

TRIONYX Geoffr.

TRIONYX CELLULOSUS Cope.

Two small fragments of the carapace are all that represent this species. The sculpture is, however, exceedingly characteristic, and different from that of any either recent or fossil species known to the writer.

The surface is marked by numerous closely placed pits, which are remarkably deep, producing the vesicular appearance of scoria. The resemblance is heightened by the irregular size of the pits. Edges of septa rounded. The fragments are unusually thick, indicating a species of large size.

	Lines.
Width of free portion of rib at origin	7·5
Depth of portion of carapace	4·33

TRIONYX sp.

An uncharacteristic portion of the carapace, which exhibits larger and more regular pits, separated by wider partitions. The pits at one extremity are larger than those of the other, and the septa narrower.

CHELONE Brongt.

CHELONE sp.

A proximal portion of the costal plate has a thickness of three lines, but rapidly thins out. Its surface exhibits transverse rugæ at its proximal extremity; elsewhere the rugæ are longitudinal, and more distinct on one side than the other.

CHELONE sp.

Two fragments of the carapace of a large and convex species, each with a strongly marked groove for the margin of the dermal shields. The surface is without sculpture.

CROCODILIA.

THECACHAMPSA Cope.

This genus resembles Crocodilus L., but differs in the entire hollowness of the external stratum of the crowns of the teeth, and their composition of closely adherent concentric cones. These internal cones, which number at least three, may be homologous with the included crowns of the successional teeth of other Crocodilia, but they must be regarded as functional in a physiological sense, since they compose the bulk of the crown of the tooth, within. They resemble in this respect Mosasaurus, and probably represent a genus near the Mosasauridæ. In none of the specimens at my disposal is the root preserved, though the width of the basal margin of the crown in T. contusor indicates its probable existence.

THECACHAMPSA CONTUSOR Cope.

This species is established on a single tooth. It is remarkable for its short conic form. The basis is circular, and its diameter is three-fifths the length of the tooth. The apex is rather acute and circular in section; it is directed to one side, and the tooth is slightly flattened on the inside of the curve. This face is bounded by a low obtuse ridge on each side, for the basal two-thirds of the crown, which are not distinguishable from a series of ridges which mark, at distances of a line, the basal three-fifths round the crown; they are less distinct on the convex aspect, and are separated by concave surface. Instead of the cutting ridges of the genus Crocodilus, the apex is provided with a narrow flattened plane on each side. The surface of this portion, and of much of the convex face, is marked by a minute decussating or chevroned sculpture. Vertical length, 14·5 lines; diameter of base of crown, 8·5 lines.

THECACHAMPSA SERICODON Cope.

This species is based on a number of specimens of elongate conic crowns, which resemble to a considerable extent those of Crocodilus antiquus Leidy, of the same epoch. They differ from the T. contusor in their more compressed and elongate form, the presence of a sub-acute ridge on each side the apical three-fifths the crown, the absence of the lateral grooves, and the chevron sculpture. They are, on the contrary, minutely striate, and possess a silky lustre.

Length of medium specimen, 16·5 lines; base of crown, 9 lines.

CETACEA.

Premising that a number of species whose remains occur in the present collection must, for the present, be passed by, I append a list of the extinct Cetaceans described from North American formations, up to the present time:

BALÆNIDÆ.

Balænoptera prisca Leidy, Cope, miocene. Pr. A. N. S. 1851. 308.

Eschrichtius cephalus Cope, miocene.

Eschrichtius leptocentrus Cope, miocene.

? Balæna pal.eatlantica Leidy, miocene. Pr. A. N. S. 1851, 308.

DELPHINIDÆ.

Beluga vermontana Thompson, Champlain. Nat. Hist. Vermont.

Delphinus conradi Leidy, miocene. Pr. A. N. S. 1853, 35.

Lophocetus calvertensis Harlan, Cope, miocene. Trans. Nat. Acad.

Priscodelphinus harlani Leidy, miocene. Pr. A. N. S. 1851. 327.

Priscodelphinus acutidens Cope, miocene.

Priscodelphinus grandævus Leidy, miocene. Pr. A. N. S. 1851. 327.

Rhabdosteus latiradix Cope, miocene.

CATODONTIDÆ.

Orycterocetus cornutidens Leidy, miocene. Pr. A. N. S. 1853, 378.

Orycterocetus crocodilinus Cope, miocene.

Physeter antiquus Leidy, pliocene. Pr. A. N. S. 1853, 378.

Ontocetus emmonsii Leidy, miocene. Pr. A. N. S. 1859, 162.

CYNORCIDÆ.

Cynorca proterva Cope, miocene.

Squalodon debilis Cope, pliocene.

Squalodon wymanii Cope, miocene.

Squalodon mento Cope, miocene.

Squalodon holmesii Leidy, pliocene.

Squalodon atlanticus Leidy, miocene.

BASILOSAURIDÆ.

Dorydon pygmæus Cope, eocene.

Dorydon serratus Gibbes, eocene.

Basilosaurus cetoides Geinitz, eocene.

Descriptions and notes on many of the preceding are given below.

ORYCTEROCETUS Leidy.

This genus differs from Physeter in the extensive pulp-cavity of the teeth, and the absence of surface cementum.

Orycterocetus crocodilinus Cope.

This species is based on a tooth belonging to an individual of one-third or one-fourth the size of the known species O. cornutidens Leidy, but nevertheless adult, as attested by the obliquely worn apex of the crown. The general form is that of an elongate curved cone, with flattened sides, and a broader convex face within the curve, and a narrower one on the outside. The tooth

is marked by numerous irregular transverse lines, similar to those frequently marking growth, and by longitudinal shallow grooves. The pulp-cavity extends for two-thirds the length of the tooth, being thus relatively deeper than in the known species, and is also very large, thinning the external wall out to an open basis. In the known species the walls are relatively thicker, and for a considerable distance parallel to each other. The form of the tooth is in some degree similar to the crown of the canines of some crocodiles. There is no enamel on the teeth of Cetaceans of this genus.

Total length, 2 inches 5 lines; long diameter at base, 8·25 lines; diameter at middle, 6 lines.

RHABDOSTEUS Cope.

This genus is either referable to a family not yet characterized, allied to the Platanistidæ and Delphinidæ, or belongs to the first named of these recent families.

Premaxillary and maxillary bones forming a cylinder, bearing teeth on its proximal portion, and prolonged in its distal portion into a slender straight beak. Teeth with the enlarged crown separated from the fang by a constriction.

This is one of the most remarkable genera of Cetaceans, and may be compared to its affines as Xiphias is to other Teleostei.

RHABDOSTEUS LATIRADIX Cope.

A portion of the muzzle of this species, which is preserved, measures 12 in. 7·5 lines in length, 12·5 lines in transverse, and 11 lines in vertical diameter at the base. The superior edge of the maxillary bone forms the external outline, while the remainder of this element is entirely inferior. The palatine face is convex, and the alveolar series approximated. The alveolæ themselves are longitudinal, two in ·75 of an inch, and separated from each other by spongy septa. The vomer does not appear in the portion of the muzzle at my disposal.

	Lines.
Width of premaxillary	6
" superior face maxillary	4·75
" palatine face of maxillary	4·5

Three teeth are referred, with much probability, to this species. The fangs are from equal to to twice the length of the crowns, and are much compressed, widening downwards, and more or less prolonged at one inferior angle, in the same plane. The crown, compressed transversely to the root, and expanded above the base, straight or slightly curved in the direction of its plane. Enamel smooth, edges obtuse. The compressed fang corresponds to the longitudinal alveolus, while the transverse dilatation of the crown is similar to the form of those of *Platanista*.

	Lines.
Length of largest specimen	12
" " crown	5
Width of fang	3

Jas. T. Thomas, the discoverer of this Cetacean, tells me that he has seen portions of the muzzle between two and three feet long. From the gradual acumination of the individual here described, the length of the muzzle alone might have been at least of that length. A slender piece, evidently a portion of the premaxillary of a smaller individual, is fourteen inches in length. Its posterior portion is deflected, as if to give place to the prenarial triangle, and its inner margin descends abruptly to the same.

PRISCODELPHINUS Leidy.

In this genus the muzzle is elongate and flattened, and furnished with cylindrical fanged teeth, which extend throughout much or all of its length. The symphysis mandibuli is very elongate. The teeth have not been described. Delphinus canaliculatus von Meyer, from the Swiss Tertiary, appears to belong to it. (Palæontographica, 1856, p. 44).

PRISCODELPHINUS ACUTIDENS Cope.

This species is represented by a single tooth, which is apparently that of an adult of much smaller size than either of the known species of the genus. The fang is straight, fusiform, and cylindrical in section. It is constricted immediately below the crown. The latter is curved conic, the face within the curve bounded on each side by a low but acute ridge, which extends from near the acute apex to near the base. Enamel polished, smooth. Extremity of fang acute, solid.

Total length 7 lines; length crown 3·2 lines; diameter of base crown 1.4 lines.

LOPHOCETUS Cope.

Temporal fossa truncated by a horizontal crest above, prolonged backwards and bounded by a projecting crest, which renders the occipital plane concave. The same crest prolonged upwards and thickened, each not meeting that of the opposite side, but continued on the inner margins of the maxillary bones, turning outwards and ceasing opposite the nares. Front, therefore, deeply grooved. Premaxillaries separated by a deep groove. Teeth with cylindric roots.

LOPHOCETUS CALVERTENSIS. *Delphinus calvertensis* Harlan. *Pontoporia calvertensis* Cope, Proc. Acad. 1866.

This species is near to the Pontoporias, but differs as above, so as to be referable to another genus. The form of the occiput indicates the insertion of powerful muscles, a condition which does not exist in any of the true Cetacea within the knowledge of the writer, excepting in Inia and in Arionius, von Meyer, from the Swiss Miocene. The latter genus resembles it also in the superior truncation of the temporal fossæ, but here all similarity ceases, for in Arionius the frontal bones are well developed, while in Lophocetus they are, as in true Delphinidæ, mere narrow transverse wedges. They are, indeed, much less developed than in Pontoporia, or even than in Inia.

The resemblance to Inia is closest. The only feature which renders a generic distinction certain is the cylindric form of the posterior alveolæ, which renders it probable that the teeth were not furnished with lobes as in Inia. In the latter the fangs have a transverse dilatation to support these. Harlan also states that but one and a half inches of the muzzle are broken away. If this be the case, the genus is short-muzzled and with the symphysis mandibuli not elongate. This is, however, exceedingly doubtful.

In Lophocetus c a l v e r t e n s i s the nasal bones are separated by a deep fissure. The maxillaries exhibit, on each side in front of the external nares, two oval, roughened surfaces, which converge behind the nares. These appear to be insertions, perhaps for cartilaginous crests, comparable to the bony roofs of Platanista, less probably, for muscles connected with the external meatus.

The form of the muzzle is not as elongate as in the known species of Pontoporia, and it is much expanded, proximally, instead of contracted, as in the latter.

This dolphin approximated the larger white whales (Beluga) in size.

ESCHRICHTIUS Gray.

The genus Megaptera Gray embraces species of large size, living in the recent seas, known as the hump-backed whales. There are six species known, from different seas, of which one, Megaptera o s p h y i a Cope, occurs on the Atlantic coast of the United States. An examination of some specimens of periotic bones and vertebræ, from near Yorktown, Virginia, first indicated to the writer the existence of a supposed species of the genus, in the Miocene period, and it was mentioned in these Proceedings, 1865, 180. In the present collection the remains of an allied or the same species are preserved. These are, the premaxillary bones, nearly complete; the rami of the mandible, nearly

perfect; the first, third, fourth, fifth and seventh cervical vertebræ; several caudal and lumbosacral vertebræ, humerus, ulna, carpal bones and phalanges. The attachment of the epiphyses everywhere, indicate an adult animal.

In the genus Megaptera the transverse processes and the parapophyses of the second and succeeding cervical vertebræ are always separate, and not united at their extremities. Those of the second are usually very broad at their origins. The gular region is folded, and there is a knob on the back, representing the dorsal fin of the finner whales.

The above-named specimens, however, appear to belong to the genus Eschrichtius, recently established by Dr. Gray. It is near to Megaptera, differing technically in the presence of an acromion* on the scapula. As this piece is wanting, I rely on another feature pointed out by Gray, the great size of the neural canal, as compared with the vertebral centra. In the fin-backed whales, Balænoptera (*Balænoptera* and *Physalus* Gray), this author states its diameter to be not more than half that of the body; in the specimens before me it measures from six-sevenths to over two-thirds the latter, thus resembling the Eschrichtius robustus. It also exhibits the same affinity by the small size of the coronoid process.

Before considering the species from the Thomas collection, another species previously represented in our Museum may be noticed.

This, a second cervical vertebra from the Miocene of Eastern Virginia, differs from that of any known species in the slenderness and depressed form of its parapophyses, and in its transversely parallelogrammic form. It is without epiphyses, and is therefore part of a young animal, but when compared with the third cervical of the adult specimen above alluded to, is considerably larger. The vertical depth is the same in the two, but the transverse diameter of the Virginia specimen is 1·5 inches greater. The parapophyses are also nearly transverse in the latter; in the Maryland specimen, directed downward at 45° from the horizontal. I record it at present as—

ESCHRICHTIUS LEPTOCENTRUS Cope,

Since it is not likely to have pertained to the species already described by Leidy, Balænoptera prisca and Balæna palæatlantica. The former was described from a portion of a mandibular ramus, which, when restored, would have measured 4·75 feet in length, giving a total length of 21 feet. As there are no evidences of immaturity in the specimen, it is probable that its size was not greater than, if as great as, the existing Balænoptera rostrata.† Its affinity to this species is confirmed by the slender proportions, and great external convexity of the ramus. Its superior and inferior aspects are broad and nearly similar. The species is well distinguished. The B. palæatlantica is based on a portion of the mandible of an individual of not more than thirty-five feet in length. The inner face is more convex than in the last, and more so than in any known Megaptera. It also presents the peculiarity of two rows of vascular foramina, closely approximated on each side of the superior median ridge; this has not been observed in that genus or Eschrichtius.

The species from Maryland is near thirty-five feet long, according to the usual estimate. The E. leptocentrus has no doubt attained a considerably greater size, since its cervical vertebra is longer, and is that of a young individual. It will not be unsafe to ascribe to it a length of 50 feet.

	In.	Lin.
Transverse extent of centrum	6	
Vertical diameter	4	
Length of body (below, with epiphyses restored)	1	8·75
Distance between origins of dia- and parapophyses	2	3

* The genus *Poecopia* (?) Gray, established for hump-backed whales with a coracoid process, does not seem to differ from Megaptera, where that process sometimes occurs.

† A fine specimen of this species, over 30 feet long, went ashore during the autumn of 1866, on the Long Beach, N. J. It was much injured, probably by the killers. This species has not been before noticed on our coasts.

	In.	Lin.
Vertical depth odontoid elevation (under epiphysis)	2	5
Superior width " " " "	1	10
Diameter base of dia- and neurapophysis		7·5
" neural canal (in part estimated)	4	10

ESCHRICHTIUS CEPHALUS Cope, sp. nov.

The species whose remains are above alluded to as having been preserved by Jas. T. Thomas.

The atlas of this species most nearly resembles among existing Cetaceans the Balænoptera rostrata, in the width of the neural canal above, and the inferior position of the diapophysis and cotyloid articular face. That most essential point, the form of the dia- and parapophyses of the second cervical, not being attainable, owing to the absence of that piece, it becomes necessary to decide on the real relations to the B. rostrata on other grounds. The lack of elevated coronoid process of the mandible contradicts this affinity, while the narrowness and steeply descending angle of the parapophyses of the third cervical render it very improbable that the dia- and parapophyses of the second were united, if they observed their usual parallelism. This is confirmed by the fact that they are not united in the E. robustus Lillg.; though the parapophyses of the third have in it an almost transverse direction.

This species may be compared with the known species of this genus, and of Megaptera, as follows:

The third and fourth cervical vertebræ exhibit the quadrate form attributed to the E. robustus and M. lalandii, and the above-described E. leptocentrus. The form of the centra in M. longimana and M. osphyia is more ovate.

The parapophyses of the third cervical are flattened in the plane of the centrum; their axes are continuous with those of the combined dia- and neurapophyses, and the connecting lines cross at a superior angle of 50°. In the E. robustus these processes have a transverse direction, according to Liljeborg. In the fourth cervical of the miocene species, the parapophyses have a still more vertical direction. The fifth and seventh cervicals are prominently rounded below, a feature not seen in the M. lalandii and E. robustus, and neither of them possess parapophyses. The floor of the neural canal is convex in all the cervicals, most strongly in the posterior. In E. robustus it is plane in Gray and Lillgeborg's figures; they are similar in the E. leptocentrus and in the Megaptera. The neural arches are more or less broken away, but enough remains in the third to give the width of the neural canal. The diapophyses of the fifth and seventh are directed backwards, and the bodies of all are convex in the same direction.

The atlas is notable for the want of a neural spinous crest, and in the inferior position and obliquity of the cotyloid cavity. The latter are separated by an inch below; in the same interval behind there is a transverse, very obtuse *tuberculum atlantis*. The inferior portion of the perforation, or *foramen dentati*, is much narrower than the neural arch.

	In.	Lin.
Vertical depth of atlas	6	5·3
" " " perforation	3	9
Total width of atlas (exclus. diapophysis)	8	2
" " " articular cotylus	3	8
Greatest transverse thickness atlas above	2	4·5

The diapophysis is compressed, its base oblique, descending in front. The neural arch on each side is at right angles to the long diameter of the articular faces.

	In.	Lin.
Diameter of centrum third cervical	4	7
" " parapophysis at base	1	2·5
" " neur. diapophysis at base	1	2·5

Diameter of neural canal (greatest)	4	
Depth centrum	4	1
Length "		9·5
Transverse diameter of fifth cervical	4	9
" " " neur. diapophysis	1	6·5
Vertical "	4	5·5
Length centrum		10·5
Transverse diameter seventh cervical	5	3
" " neur. diapophysis	1	8
Vertical " centrum	4	5
Length centrum	1	2
" " of an interior caudal	5	2
Vertical diameter of anterior face	4	9
Transverse " " " "	5	7·5
Height neural spine (worn)	1	7·5
Length diapophysis (worn)	1	7·5
Width of inferior concavity	1	8

The caudal vertebra measured has the elongate form of those of the Balænopteras, and two strong inferior ridges, separated by each other by a deeper, and from the diapophyses by a shallower concavity.

A considerable portion of both premaxillary bones preserved shows an elongate muzzle; their form is narrow, especially towards their distal extremity, where they are much flattened; for a short distance posterior to that point they are subcylindrical and grooved.

	Ft.	In.
Length preserved (proximal end wanting)	6	8
Width near proximal end		3·5
" " distal		2·5

The mandibular rami are massive, moderately curved, and considerably compressed, especially on their distal fourth. The interior face is everywhere nearly flat, the exterior convex; the superior ridge is rather acute; the inferior aspect obtuse, narrow. A series of large distant vascular foramina extend along the outer face some distance below the superior ridge. The coronoid processes have been broken off; their bases would indicate that they were compressed, and not elevated.

	Ft.	In.
Length of jaw to opposite coronoid	7	0·5
Total length (restored after E. robustus)	9	4·5
Depth one foot from extremity		4·8
" two feet in advance coronoid proc		8

The great length of the ramus as compared with the size of the cervical vertebræ is a remarkable feature. In two not distantly related species, following, they are:

	Diam. vertebræ.	Ramus.	Total.
Eschrichtius robustus (3d c.)	8·75 in.	8f. 2 in.	47
Megaptera longimana (1st d.)	8'5	10·7	34·6
Eschrichtius cephalus (7th c.)	5·25	9·4	31

The proportion of the last cervical to the ramus is probably one-fourth less in the new species than in the second-named, and it might therefore be supposed that the head would bear a greater proportion to the total length than in Megaptera longimana, and thus approach the Balæna mysticetus. This great proportion is reduced by the indications furnished by posterior vertebræ which have the elongate form of those of the Balænopteræ. This point being opposed to the other, it seems probable that the proportions most nearly approached those of the B. longimana, as above estimated, and that while this Cetacean possessed a larger head than the Eschrichtius robustus, its absolute length was less.

The form of the anterior limb presents us with a striking peculiarity of this

species. It was remarkably short, approaching the species of Balæna, and differing from E. robustus, still more from the Sibbaldii and Balænopteræ, and most from Megaptera longimana.

	In.	Lin.
Length humerus	11	8
Least width	4	4
Distal "	5	3
Length radius (straight line)	15	5
Proximal width	3	6
Distal "	4	

The humerus is flattened in one plane, and has an elevation near the middle of the infero-posterior margin, for muscular insertion. The shortness of the limb is a consequence of the small size of the radius and ulna.

Two carpals and one phalange are preserved. The former are as deep as wide, oval; one longer, and composed of two united centres of ossification.

	In.	Lin.
Length of longest carpal	2	6
" " phalange	3	2
Width " "	2	3

In conclusion it may be asserted that a rather more than usually fortunate coincidence in the preservation of important parts of the skeleton has enabled the writer to explain with some degree of accuracy the characteristics of this monster of the deep, almost the largest mammal of the miocene period yet known, but few of whose fellow leviathans have been as yet indicated by fragments only.

SQUALODON Grateloup.

Van Beneden Ac. Roy. Belg. 1865. *Phocodon* Agass., *Crenidelphinus* Laurill, *Macrophoca* Leidy, *Delphinoides* Pedroni, *Champsodelphis* Gervais.

This remarkable genus of Cetaceans, at one time supposed to be identical with the Basilosaurus (Harlan), has recently been greatly elucidated by the investigations of Prof. Van Beneden of the University of Louvain. The discovery of remains of more than one allied species in the neighborhood of Antwerp was the immediate stimulant to these researches. Jourdan and Van Beneden have proven the distinctness of this genus from Basilosaurus, in its much shorter cranial cavity, and posteriorly placed nasal meatus. The nasal bones are abbreviated and flattened, as in the whales, while those of the Basilosauri are elongate, prolonging the nasal meatus, and throwing the nares far anteriorly. The latter thus approximate the Pinnipedia, while the Squalodons are more typical Cetaceans.

The present collection contains remains to be attributed to this genus, and which will be made subjects of illustration. At present a brief notice of dental features will suffice.

A considerable amount of variation among teeth situate in different positions in the jaws of the same species, has been shown in the above mentioned essay to exist. In consequence, remains, assigned by authors to various genera, have been, with much probability, referred to the genus Squalodon.* The same erroneous references had also been made in this country, but to a less extent. The remains on which these, and the present notices are based, indicate much paralellism between the marine faunæ of the coasts of America and Europe, during the Yorktown Epoch.

Remains of nine individuals at my disposal indicate several species of this genus. They may be compared as follows with those already known.

* Prof Van Beneden adopts this name, and rejects that of Basilosaurus for Harlan's genus, probably on the ground of the ill application of the latter to a genus of mammals. The application of the name Squalodon is, however, even more faulty, and it has not the merit of classic composition, like Basilosaurus.

I. Molars with two roots.

** Premolars with short conic crowns.

Premolars compressed, cutting.

Roots of premolars compressed.....S. protervus.

Promolars not compressed, bent.

Size small.

Premolars with crowns bent.....S. wymanii.

Size large.

Extremity of mandible much recurved; alveolae superior.....S. mento.

Extremity of mandible little recurved; alveolae lateral....S. grateloupii.

** Premolars with elongate conic crowns.

Enamel of premolars smooth.

Roots of premolars very long.....S. holmesii.

Enamel of premolars ridged or striate.

Premolars striate; muzzle short, broad; molars serrate on both edges.....S. ehrlichii.

Premolars ridged; muzzle long, slender; molars serrate on both edges (except one or two anterior.).....S. atlanticus.

Premolars ridged; muzzle long, slender; molars serrate only on the posterior edge.....S. antverpiensis.

II. Molars (or a portion of them) with three roots.

Denticules on the posterior edge only, step.like.....S. gervaisii.

Of the above species, the two rooted molars of S. protervus, S. wymanii, S. mento, and S. holmesii are unknown. It is, however, altogether probable, from the usual correlation with the form of the molar teeth, that there are three genera included in the preceding synopsis. Prof. Van Beneden states that probably the S. gervaisii will be found to pertain to an unnamed genus. Of this there is as yet little evidence, as the character of the three roots is not seen in a second molar figured by Gervais. The remaining species may be arranged as follows:

CYNORCA Cope, sp. C. proterva Cope.

SQUALODON Grateloup, sp. S. mento Cope, S. wymanii Leidy, S. grateloupii Von Meyer.

COLOPHONODON Leidy, C. holmesii Leidy, C. ehrlichii Van Beneden, C. atlanticus Leidy and C. antverpiensis Van Beneden.

Lastly, may be added the gigantic ally of the above, described by Von Meyer and Van Beneden,

STENODON Van Ben. S. lentianus Von Meyer.

SQUALODON PROTERVUS Cope.

This species is represented in the collection by a single canine tooth, which presents the usual small crown and broad fang of the Cetacea. The fang is, however, shorter than in any homologous teeth in the other two genera above named and, with the crown, very much compressed in one plane. A shallow groove extends on each side of it to the narrowed and flattened truncate base. The tooth is widest at the middle of the fang; the crown is rapidly acuminate, narrow lenticular in section, and furnished with a rather thickened postero-internal cutting edge. The anterior or external aspect is worn away by the attrition of a corresponding tooth, but was obtuse, and furnished with a longitudinal ridge on each side at the base of the crown. The surface of the enamel is rugose, more minutely on one side than on the other. The tooth is considerably curved. While the enamel is polished, the fang is roughened and opaque.

	In.	Lin.
Total length on middle	1	10.5
Length of crown		
Width at base of crown		4·5
" " middle of fang		5.25

The length of the root of this tooth renders it improbable that it was a transitional molar, that is, intervening between the premolars and molars. Two teeth, having crowns similarly though rather more symmetrically formed, are in the Academy Museum, and these I suspect to have occupied that position. The present is more likely to have been an elongate tooth near the position usually occupied in Mammalia by the canines. There can be little doubt that the genus Cynorca, to which I refer it, will turn out to be well characterized.

The tooth of a closely allied animal is figured by Giebel, Odontographia xxxvi, 10, 11, 14, after Von Meyer. I have not been able to find the description of it, if existing.

SQUALODON WYMANII m. *Phoca wymanii* Leidy. Proceedings Academy N. Sci. 1856, 265.

Of this, the smallest species of the genus, three premolar teeth are in the collection, and the type specimen is in the Academy's Museum. The teeth are remarkable for the abrupt posterior direction of their crowns. The roots are curved, one of them abruptly so, and flattened.

SQUALODON MENTO Cope. Cetacean, Wyman, Amer. Jour. Sci. Arts, 1850, 230-232, figs. 4, 5, 6, 7.

This species is represented by four premolar teeth. The fang in these is thickest just below the base of the crown. No. 1 has a conic slightly curved crown, oval in section; it is grooved on the sides and minutely rugose elsewhere. The fang is polished, compressed, slightly curved in two directions, and grooved on its sides, one, the strongest, on the inner side of a curve and continuous with the grooving of the crown. At the base of the crown, on the side of the groove, is as light swelling. In Nos. 2, 3 and 4 the fangs are rugose, in No. 2 more cylindrical and slightly grooved laterally with open pulp cavity. Nos. 3 and 4 exhibit this cavity closed—in No. 4 by a distinct bony plug, and their fangs are much curved. In No. 3 the crown is smaller and more conic than in No. 1; it is rugose and furnished with a delicate continuous ridge on the outer and inner borders of its incurved plane. In No. 4 the crown is as broad at the basis as No. 1, but is much less elevated, and abruptly recurved. It is subtrihedral in form, and is provided with a distinct tube at the base, behind the recurvature. The anterior outline of the crown forms the quadrant of a circle; it bears a rugulose cutting ridge, which is continued from the acuminate apex over the tubercle.

	Lines.
Length No. 1	23·5
" " crown (restored)	7·5
" No. 3	25·5
" " crown	7·
" No. 4	22 5
" " crown	6·5
Width " " at base	5·25

No. 1 approximates in position the transitional molar. A tooth, perhaps occupying that place or the next, has been figured by Dr. Wyman (Supra fig 4), as belonging to the genus *Phocodon* Agass.* The anterior premolars and a portion of the mandible, no doubt belonging to the same species, are figured in the same place as above. They belong to an animal much smaller than that to which the teeth above described pertain, and it is a matter of some question whether these specimens do not rather relate to the S. wymanii Leidy. The teeth, however, do not exhibit that abrupt flexure of the crown

* It also bears much resemblance to those of the recent Inia.

seen in the latter species. These premolar teeth bear considerable resemblance to those of the genus Otaria, and explain the reference of several of the species to seals by Gervais, Leidy and others.

If the S. mento be as I suppose, nearly allied to the S. grateloupii, it differs in the more recurved extremity of the symphysis, and the more vertical direction of the teeth. This comparison is, however, based upon the determination of Van Beneden, that the mandible figured by Gervais as *Champsodelphis macrogenius* (from Leognan near Bordeaux) really belongs to the Sq. grateloupii. A portion of maxillary and premaxillary bones with teeth, said by Gervais to belong to the former, obviously does not relate to the latter; hence the probability of the existence of another species to be called Sq. macrogenius. The teeth named by Gervais as *Phoca pedronii* and *Phoca* sp. (Tab. viii f. 8) are evidently those of a species allied to Sq. mento m. Relying then on Van Beneden's determination, the Sq. grateloupii is more nearly allied to the two preceding species in the lack of long conical premolars and canine-like teeth, than it is to the species included here under the head of Colophonodon. In the latter these weapons are of great length and strength, and the anterior, according to Van Beneden, may be called small tusks. A species still smaller than the S. wymanii has been described by Leidy as *Phoca debilis*, from the Pliocene of Ashley River of S. Carolina. It will no doubt be found to be allied to Squalodon (vid. Pr. A. N. S. Phil. 1856, 265).

SQUALODON HOLMESII Leidy M. S.* *Colophonodon holmesii* Leidy. Proceedings Academy 1853, p. 377.

The size of this species was probably near that of the S. mento, and smaller than that of the S. atlanticus. Its geologic position is supposed to be the pliocene, while the other species of the genus have been discovered in miocene beds. It is, therefore, not represented in Thomas' collection.

SQUALODON ATLANTICUS Leidy MS. *Macrophoca atlantica* Leidy, Proceed. Acad. 1856, 220.

Remains of three individuals of this species before me indicate considerable variety in the forms of the two rooted molar teeth.

The individual from which Leidy determined the species is represented by only three true molars. Of these, the posterior, with more curved and divaricate fangs, is smaller, and presents four crests behind, and two in front. The next presents the same number of crests, with the addition of a basal rudimentary one in front. In the other molar, which has a slightly more elongate crown, three and a rudiment may be counted behind, and none in front.

The second individual is represented in the Thomas collection by the proximal portions of the maxillary bones of both sides, and seven molar teeth in place At least four of the most posterior molars were inserted in oblique alveolæ, overlapping by their anterior fang the inner face of the posterior fang of the tooth in front. Anterior to these the alveolæ are less oblique, and separated by spaces. The palatal face is moderately convex, while the external surface is divided into two plane faces by an angulated line, which is strong posteriorly, vanishing anteriorly. These bones indicate a muzzle of proportions similar to those of the Sq. antverpiensis Van Beneden, and a cranium of thirty inches in length.

The teeth themselves, from their entire absence of worn surfaces, may be supposed to belong to a young individual. They are longitudinally wrinkled, and present a thick anterior and posterior cutting edge. The serrulations stand from behind, $\frac{3}{2}$ $\frac{2}{2}$ $\frac{3}{2}$ $\frac{3}{2}$, the anterior two of the last being very weak. The cutting edge of all these is serrulate. Not only in the number of the crests, but in the more elevate conic apex, do these teeth differ from those of the foregoing individual.

* Prof. Leidy informs me that he has arranged this and the succeeding species in the genus Squalodon in the MSS. of his work on North American extinct mammalia.

The third individual is represented by one true molar, and two caniniform premolars. The former is considerably smaller and more conic than the others, and exhibits a minute knob only on its anterior edge, to represent a crest. On the posterior aspect there have been three crests on the basal three-fifths the crown, worn off by mastication. The fangs are connected by a thin lamina, as in the second described specimen, and not, as in the first, by a thick wall.

One canine is larger, and with perfect root; the other smaller, a little more compressed, and without fang; it exhibits a rather large conic pulp cavity. The fang of the first is one-third longer than its crown; it is slender, slightly compressed conic, and without cavity at the extremity. The crown is coarsely striate and rugose between the striæ; two of the latter are elevated into obtuse anterior and posterior cutting edges. Diameter greatest at base of crown; latter slightly curved.

	In.	Lin.
Length of basis of large molar of No. 1		13
Height of enamel of same		10
" " " in No. 2		13
Length bases of 2, 3 and 4 molars (from behind), No. 2	3	4·5
Width palatine face at 3d molar, No. 2	3	8 75
Length canine, No. 3	4	
" fang of do	2	4 5
" basis of molar crown, No. 3		11
Height of " " " "		9

No. 1 was discovered in the miocene of New Jersey; the others were in the Thomas collection.

The question arises as to the specific identity of these individuals. The molar of No. 3 at once suggests a species different from No. 2 in smaller adult size, and lack of anterior denticles. It could not be considered as a transitional molar. These are shown by Van Beneden to be premolars, which assume traces of the characters of the true molars. The present tooth, in its form and double fang, is evidently a true molar. The discovery of the tooth of No. 1 without denticles, however, invalidates this peculiarity as a ground of difference in the present case, and furnishes a character of the species. Those whose dentition is known exhibit an abrupt commencement of characteristic true molars, without material approximation in the forms of their crowns to those of the premolars. The shorter apex and increased number of denticles on the posterior face in the specimen No. 1, I regard as an individual peculiarity.

The question as to the identity of this species with the Sq. g r a t e l o u p i i depends in part on the identification of various short crowned teeth, described by Gervais as its premolars. The strong median angulation of the external face of the posterior part of the maxillaries, is a feature not described or figured as existing in the latter species. The affinity of the S. a t l a n t i c u s is really nearer to the S. a n t v e r p i e n s i s of Van Beneden, if it be not the same. The only characters which I can at present assign as distinctive, are the absence of denticles on the anterior edge of the molars throughout the series, and the non-overlapping of the four posterior of these teeth. The general proportions of the jaws and the form of the canine premolars are very similar in the two species. If, as I suppose, my description of No. 2 is taken from a young animal, its adult dimensions will exceed those of the S. a n t v e r p i e n s i s.

DORYODON Gibbes.

Proc. Acad. Nat. Sci. Philada. 1845, 254. *Pontogeneus* Leidy, op. cit. 1853, 52.

This genus has been regarded as identical with Basilosaurus by Professor Müller, if, as is stated by Müller, l. c. (and Bronn, Lethæa Geognostica), the

species described by the former author is congeneric or identical with that described by Gibbes. Authors generally seem to have settled down to the belief in the identity of the two genera, the only exception being Prof. Van Beneden, who, in his essay on Squalodon, doubts the generic identity of *Basilosaurus macrospondylus* and *B. brachyspondylus* of Müller. Enough is now known of the Cetacea to render it certain that these two species cannot belong to the same genus, the elongate form of the dorsal vertebræ of the true Basilosaurus cetoides sufficiently characterizing that genus, as compared with the more usual Cetacean form of those of the present type. This feature was, however, not known to Gibbes, who endeavored to establish the genus on the hollowness of its teeth,—a character dependent, perhaps, on development.

DORYODON PYGMÆUS Cope. *Zeuglodon pygmæus* Müller, Ueber die Zeuglodonten, Berlin. *Pontogeneus ? priscus* Leidy, op. cit.
Eocene. Louisiana, Alabama.

DORYODON SERRATUS Gibbes, l. c. *Basilosaurus serratus* Gibbes, Journ. Acad. i. 10. *? Zeuglodon brachyspondylus* Müller, Ueber d. Zeuglodonten, 1849, 26. Tab.
Eocene. Alabama, South Carolina.

BASILOSAURUS Harlan.

Trans. Amer. Philos. Soc. Philada. 1834. *Zeuglodon* Owen, Trans. Geolog. Soc. London, 1839.

BASILOSAURUS CETOIDES Geinitz, Unters. ueber *Hydrarchus*, Dresden, 1847 (cum Carus et Reichenbach), Gibbes, Jour. Acad. Nat. Sci, 1847, 1.
Eocene. Arkansas, Alabama.

Supplement.

In the same collection are portions of mandibular rami of two species of terrestrial Mammalia, which would not appear to be referable to the same stratigraphic horizon. No beds regarded as postpliocene have as yet been indicated from the shores of the Patuxent, though the below-mentioned species have been most probably derived from such a deposit. These, with the other beds of other epochs, are buried under from ten to thirty feet of rather fine gravel drift.

DICOTYLES TORQUATUS Cuvier.

Portions of both rami of the mandible with permanent and deciduous molars and canines of a small individual. The former are similar to those described by Leidy in Palæontology of South Carolina, by Prof. Holmes, and closely resemble those of the common Peccary. They lack, however, the cingulum crossing the interspace between the external pair of tubercles.

GALERA MACRODON Cope, sp. nov.

This species is based on the greater portion of the right ramus of the mandible of an adult, containing three molars in place, the alveolæ of the first and of the last, with a considerable portion of that of the canine.

The alveolus indicates a canine of large size. The basis of first premolar is turned obliquely outwards, and is two-rooted. The second and third premolars are separated by a space; they have well-marked cingula, but neither posterior nor internal tubercles. The sectorial is elongate, more than twice as long as wide, the inner tubercle well marked, acute, the posterior lobe flattened, elongate; anterior lobe narrowed. Alveolus of the tubercular molar longitudinal, receiving a flattened fang with a groove on each side. Inferior face of ramus below anterior line of coronoid process, broad rounded, turned outwards. Masseteric ridge only reaching the latter below near the apex of the

coronoid process, and not extending anterior to the line of the posterior margin of the tubercular molar. Ramus narrow at first premolar.

	In.	Lin.
Length of ramus from posterior margin canine to do. of tubercular	1	5·5
" to posterior margin sectorial	1	3
" third premolar		3·75
" sectorial molar		6
Width of same (posterior lobe)		2·8
Depth ramus at posterior margin first premolar		7·5
" " " sectorial		8·25
Width " " " symphysis		4·5

This species appears to have been perhaps rather larger than the Galera barbata (Gray) of Brazil, and of a rather more slender muzzle. As compared with that species, it exhibits many peculiarities. The third premolar is smaller, and the first, the sectorial, and the tubercular relatively larger. In G. barbata the first molar has but one root, and the mandibular ramus thicker and deeper. The masseteric ridge advances to opposite the middle of the sectorial molar, and is continued on the inferior margin of the ramus, much anterior to its position in the G. macrodon.

The discovery of this species adds another link to the evidence in favor of the extension of neotropical types* over the nearctic region during the post-pliocene epoch. Of thirty continental North American species enumerated by Leidy (Ancient Fauna of Nebraska, 9), all but thirteen may be said to be characteristic of that, or closely allied to the species of the present period of North America. Of the thirteen, one (Elephas) is characteristic of the old world, of one (Anomodon) affinities unknown, and eleven are represented by members of the same family or genus now living in South America.

Among marine vertebrata, as among molluscs, the equivalency with the European beds of the same age is much closer. The following parallels exhibit this relation:

North American.	*European.*
Actobatis arcuatus,	Aëtobatis arcuatus,
Myliobatis pachyodon,	Myliobatis reglianus,
Raja dux,	Raja ornata,
Plagiostomi sp.,	Plagiostomi sp.,
Priscodelphinus grandævus,	Priscodelph. canaliculatus,
Balæna palæatlantica,	? Balæna lamanoni,
Squalodon mento,	Squalodon grateloupii,
Squalodon atlanticus,	Squalodon antverpiensis.

On the genera of Fresh-water Fishes HYPSILEPIS Baird and PHOTOGENIS Cope, their species and distribution.

BY E. D. COPE.

The two genera in question are among those represented by the greatest number of individuals in the streams of the eastern district (*i. e.*, east of the Rocky Mountains) of our continent. Hypsilepis is distributed over the greater part of this area, while Photogenis abounds most in the Allegheny region, and always in the streams flowing through the Mississippi valley, as no species is known to occur in an Atlantic water. As we proceed northwards, the latter genus disappears with many others, one after another, while Hypsilepis still remains, and with its largest forms peoples the waters of the Great Lakes and the St. Lawrence.

* The genus Galera, Gray is here regarded as distinct from Galictis Bell (*Grisonia* Gray), as it possesses an internal tubercle on the inferior sectorial, which is wanting in the latter.

The food of both genera consists of insects, though Photogenis only has the pharyngeal teeth without grinding surface. In the latter genus the dorsal fin is above the ventrals; in Hypsilepis it varies from a little anterior to considerably posterior. The large scales of the lateral line in Hypsilepis are so extensively imbricate as to leave but a narrow margin exposed, giving a character and name peculiar to the genus. Teeth in the longer row in both 4—4.

HYPSILEPIS Baird.

This genus was first outlined by Prof. Agassiz, in his work on Lake Superior; it was then partially defined by Dr. Storer in his Fresh-water Fishes of Massachusetts, and later more fully by Girard, Pr. A. N. Sci. 1856. Girard has enumerated the species, which are here reviewed with the exception of two,—viz.: *H. obesus* (*Leuciscus* Storer), from Alabama, and *H. gracilis* (*Leuciscus* Agass.) These are described in such an imperfect manner as to leave no alternative but to omit them from this essay.

There are two coloration types in the genus, one where the species are adorned with red pigment (Sections I. and III.), and (Sect. II.) where a white pigment is deposited. These are most brilliant during the season of deposit of eggs, and vanish in some species later in the season. In the H. c o c c o g e n i s m. much of the brilliant coloration remains throughout the whole year. There are few sights more pleasing than the brilliant crimsons of these fishes rapidly reflected in the pure water of the mountain streams, especially where species of other genera, as Clinostomus, Chrosomus and Argyreus vary the hues with gold and black. These are as the bright birds to the forest, or flowers to the field, in the otherwise monotonous life of the waters.

Section III. approximates Alburnellus in the position of its dorsal fin. In Section II. H. a n a l o s t a n u s occasionally exhibits masticatory surface on two or even on one tooth only, thus approximating Cyprinella Girard. The Cyprinella c e r c o s t i g m a Cope is of much the same type, but is without this surface, indicating the close approximation of the two genera. This species may be established as follows, prefatory to an examination of the true Hypsilepes:

Cyprinella c e r c o s t i g m a Cope, sp. nov.

Teeth 2·4—4·2, with sharp, serrate edges. Dorsal fin inserted two scales behind that above insertions of ventrals. Dorsal line compressed elevated, rising regularly from end muzzle. Cranium convex above; muzzle narrowed in profile, slightly overhanging mouth. Eye 4·33 in length of head, 1·5 in length muzzle, and 2 in interorbital width. End maxillary opposite posterior margin nares. Ventral outline less curved than dorsal; caudal peduncle rather stout; isthmus narrow. Scales rather elevated, 8—39—3. Lateral line gently decurved over ventrals.

Head 5·25 times in total length (4·25 to origin caudal), one scale less than depth at dorsal. The pectorals nearly reach the ventrals, and the latter attain the vent. Radii A I. 8. C. + 19 + A. I. 8, the longest ray $\frac{4}{3}$ its base, and $\frac{3}{7}$ distance to longest fulcrum at origin caudal. Total length 4·52 inches; depth ·95 inch.

Color bright olive above, without line or spot; below and sides from fifth lateral row of scales above, golden silvery. All the fins except the pectorals with white pigment at their bases, without markings; a large round black spot at base of caudal.

Habitat.—Pearl River, Mississippi, at Monticello. Helen Tennison's coll. in Mus. Smithsonian, Washington, D. C. Four specimens.

I. Dorsal fin above or anterior to ventrals; teeth 2·4—4·2; anal radii I. 9.

Head more elevated, decurved above, mandible included; mouth slightly oblique; eye over four times in length of head. Dorsal and caudal neither black nor yellow-banded..... cornutus.

Head nearly plane above; mandible projecting beyond muzzle, mouth very oblique; eye less than four times in head. Dorsal black bordered; caudal yellow at base; head red striped... coccogenis.

II. Dorsal fin a little behind above ventrals; teeth 1·4—4·1; anal radii (usually) I. 8.

Head flat, descending, mandible included, mouth horizontal: eye nearly five times in head. Dorsal with a black spot behind; caudal yellow at base, head not striped; teeth smooth; larger galacturus.

Similar to the last, but smaller: the teeth more or less crenate, and the basal half of the caudal fin is not colored; a black scapular band ..... analostanus.

III. Dorsal fin well behind above ventrals; teeth 2·4—4·2; anal radii I. 11.

Head short, deep, eye entering 3·5 times; small, depth 3·75 in length; lateral line much decurved, scales 10—44—3, not black-edged; dorsal black at base..... diplæmia

Head flat, elongate; mouth very oblique; eye three and a-half times in head; small, depth one-fifth length without caudal; scales black-edged above 9—50—3. Dorsal black at base; lateral line little decurved..... ardens.

Hypsilepis cornutus Mitchell.

Girard, in Storer, Trans. Amer. Acad. Arts Sciences v. 1855, 118. Proc. A. N. Sci. Phila. 1856, 212. *Cyprinus* Mitch., Amer. Month. Magaz. N. Y. I. 324. *Leuciscus cornutus* Storer, De Kay.

This is one of the most widely distributed of our Cyprinidæ, occurring from Nova Scotia and New England through the middle and western States to beyond the Mississippi, and in the Roanoke and Tennessee Rivers southwards. In the waters of the Susquehanna and Delaware basins it is, with the Argyrens atronasus, the most abundant species. It prefers clear waters, and does not haunt rapids.

The best figure of this, as well as of some of our other Cyprinidæ, is given by Dr. Storer in his excellent Monograph on the fishes of Massachusetts.

This species is represented in its distribution by a greater amount of variation than any other of the family with which I am acquainted. The varieties are constant in a great number of their individuals. They may be enumerated as follows:

H. c. gibbus, Proc. Acad. 1864, 279.

Seven specimens from Monroe county, Mich. Scales large, six rows above lateral line, sixteen anterior to dorsal fin; it differs from the following in the great elevation of the outline in front of the dorsal fin, and other points. From the first dorsal ray the outline again descends, giving the fin a very oblique position; this extends also, when laid back, as far as above the fifth anal ray, while in frontalis it most usually reaches a point opposite the first ray only. The eye is contained four times in the length of the head—more frequently four and a half times in frontalis. The length of the head measures in the depth of the body, from the dorsal outline to the middle of the row below that bearing the lateral line; it extends nearly to the ventral outline in frontalis. The pharyngeal bones appear to be relatively rather stouter than in typical frontalis, and are not furnished with so prominent an inferior angle to the external ala. This, with the form of the body, would almost indicate a species; but as I find approximations in these and transitions in the other characters, I cannot so consider it.

H. c. frontalis. *Leuciscus frontalis* Agassiz, Lake Superior, p. 368. *Hypsilepis frontalis* Cope, l. c. 279.

[Dec.

Scales of dorsal region larger; fifteen to eighteen in front of dorsal, six above lateral line. From various streams flowing into Lakes Huron and St. Clair. Lake Superior, Agass. Holston River, Virginia, abundant. Orbit in specimens 3 in. 9 l. in length, 3·5 times in head; in specimen 7 in. 3 l., 4·75 times in head. The latter have the interorbital region arched in section, and the vertical diameter of the orbit 3·74 in the same of the head. The former, the interorbital region flat and the orbit twice in the head as before. The large specimens have a black scapular bar. They all belong to one variety.

H. c. cerasinus.

This variety is represented by specimens of rather small size, and with large scales: 6—40—3; 16 in front of dorsal fin; orbit 3·25 in head of a specimen 3 in. 9 l. in length. Head four times in length. This is a most beautiful species in the spring and summer; it is entirely deep rose, the inferior fins crimson, a dorsal and two lateral metallic golden lines; the latter only visible in life and in certain lights, as in the other varieties. Head waters of the Roanoke.

H. c. cornutus. *Leuciscus cornutus* Mitchell. *Leuciscus plargyrus* Rafinesque hinc *Plargyrus typicus* Girard. *Plargyrus bowmanii* Girard, Proc. Acad. 1856, 196 (from autopsy).

Scales of dorsal region smaller, 22 to 24 in front of dorsal fin; on sides 8—41—3–4. Dorsal region blue in spring; fins, chin and muzzle red. Dorsal region convex and compressed to dorsal fin, the head four and one-quarter times in length to base of caudal fin, and four-fifths of greatest depth of body; vertex concave, muzzle obtuse rounded; mouth terminal, end of maxillary terminating opposite posterior nostril. From end muzzle to dorsal (1st ray) $\frac{1}{2}$ths from latter to origin of caudal. Ventrals origin exactly under first dorsal, broadly truncate, not quite attaining vent. Base of anal nearly equal its anterior ray, outline slightly concave. Base of dorsal two-thirds height anteriorly. Pectoral anterior rays shortened, medial not quite reaching the ventral. Operculum one-third higher than long. Eye, diameter one-fourth length of head, and once below its rim to upper preopercular ridge. Frontal width one-half length head above. Scales $\frac{8}{4\ 1}$, about twenty-three on the dorsal line in front of third dorsal fin. Radial formula D. 1. 8; C. 4. 19. 5. A. 1. 9. V. 8; P. 1. 15. Coloration of an adult male: dorsal region as far down as the fourth row of scales dark impure blue, divided by an indistinct band of yellowish-olive one and a-half scales wide, which follows the outline of the back; bordering the dark below is a luminous line which does not attain the tail, which is very visible in the water, and from above when wet and out of water. Sides from rosy to silver-white, the scales in adults blackish at bases; anal, ventral and pectoral fins bright crimson in spring and summer, in males. Operculum rosy, head dark above. The males in spring have the branchiostegal membranes and the chin bright crimson.

Total average length 5 in. 7 lin.; head 1 in. 1 l.; end muzzle to base anal 3 in.; depth at dorsal 1 in. 4 l.; at anal 11·5 l.

The above description is taken from an adult from the Conestoga in Pennsylvania, tributary to the Susquehanna. It applies equally well to all individuals of the species, except as pointed out under the heads of the varieties, respectively. Nevertheless, the specimens from the Susquehanna are frequently distinguishable from those of the Delaware. Numerous specimens from Michigan agree with the former in having a more elongate form of head and body than specimens from tributaries of the Delaware. They often d
from those of the Susquehanna in having a row of scales more below
lateral line. In Delaware specimens the head is shorter than in the latt
more so than in the former, but the depth of the body is greater than in
entering in length to base of tail 3½ times—in the others 4 and 4⅓ times.
dorsal fin is a little more anteriorly situated in the Delaware sp
there is a row of scales more below the lateral line than in Susque

mens. With typical specimens only, these might be regarded as representing two species, and as such I have already alluded to them; but in the large number of individuals at my disposal, I find transitions in all the points. The Delaware specimens more nearly resemble the H. cornutus, figured by Dr. Storer.

General Habitat.—Eastern, Middle and Western States; head waters of the James River. There is nothing in the description of *Plargyrus argentatus* Girard (l. c. 212), from the lower James River, to distinguish it from this variety.

H. c. cyaneus.

Scales of the whole dorsal and ventral regions very small, 31 to 40 in front of dorsal fin; on sides 10—40—4. Colors very dark; above blackish-blue, all the scales black at their bases; head entirely black; pectorals black: ventrals with a broad black band and red tip; anal black in front, dorsal chiefly black; membrane of caudal blackish. In a specimen 5 in. 10·5 lines long, the orbit enters the head 4·5 times. Small tubercles extend from muzzle to vertex, are numerous on the sides of the former to rictus oris, and form a strong crest on mandibular and suborbital bones.

This well-marked variety was taken in the Montreal River, Keeweenaw Point, on Lake Superior, by John H. Slack, M. D., to whom the Academy is indebted for a number of specimens.

Hypsilepis coccogenis Cope.

Spec. nov.

The general form of this fish is moderately stout, the head elongate and straight, with large eye. The caudal peduncle is neither narrow nor broad; the dorsal outline very little elevated. Length of head four and a quarter times in total without caudal fin; greatest depth scarcely less than length of head. Diameter of eye three-fourths of frontal width, and greater than distance between its lower margin and gular plane. Scales of typical form 7—42—3. The fins rather small; pectorals extend little more than half way to ventrals, and the latter do not reach the vent. External margin of anal as long as from end of muzzle to preopercular line, or as long as pectoral; front margin of dorsal equal the same, and greater than posterior margin of same.

The colors of this fish are very pleasing. Belly and sides silver white, or in the breeding season rose-colored, bounded above the lateral line by a leaden shade. Back olive, with sometimes a brown dorsal band, sometimes the scales heavily black margined. The head blackish above, and a deep black band on the scapular arch. Muzzle and lips with a broad band behind the edge of the preoperculum and axillary spot, crimson. Dorsal fin broadly black-banded on margin, yellowish-banded medially, and crimson at base. Colors of the caudal similar, without the crimson; inferior fins milky white.

Dimensions of an adult specimen:

	In.	Lin.		In.	Lin.
Total length	5	2	Depth at occiput		8·5
Length muzzle and chin.		4·5	" at dorsal.	1	
Diameter orbit		3·75	" at caudal peduncle..		5·25

This species is only second to the H. cornutus in size, and first in the genus in beauty. Its particolored fins and crimson cheek stripe render it easily recognizable. The latter feature gives it its name. It occurs in abundance in the clear and often rapid creeks that flow into the north and middle forks of the Holston River in Viginia. Taken in the Ninth month.

Hypsilepis galacturus Cope.

Spec. nov.

The general form of this fish is fusiform, the inferior and superior outlines converging equally. The superior cranial outline descends gently and equally; the muzzle is more than usually prolonged beyond the mouth. The end of the

maxillary stands opposite the nares. The eye is smaller than in the other species, excepting H. analostanus, entering 5·5 times the length of the head in old specimens. The head enters the total (exclusive of caudal fin) 4·3 times, and the greatest depth 4·6 times. The exposed surfaces of the lateral scales are not so much narrowed as in the other species, and the lateral line is but little decurved; nos. 6—41—3; eighteen anterior to the dorsal fin. Small tubercles appear on the top of the head, the patch narrowed behind, and the sides of the muzzle. The pectoral fins reach three-fifths the distance to the ventrals, the latter the vent. The anal is larger than in most species, its outer margin as long as from end of muzzle to middle of operculum. Dorsal elevated, the height equalling depth of body at first anal ray in a male. Rays D I. 8. C+19+. AII. 9. V. 8. P. 14.

Dimensions of an adult:

	In.	Lin.		In.	Lin.
Total length	5	4	Depth at occiput		8·25
Length muzzle		3·75	" dorsal		11.75
Diameter orbit		2·75	" caudal peduncle		5·75

In life this species is steel gray above, and silver beneath; the inferior fins are milky, and the dorsal and caudal iron grey sprinkled with blackish. The hinder portion of the former has the membrane black and the rays cream colored, and the whole base of the caudal is cream yellow.

This fine species is abundant in the tributaries of the Holston River in Virginia. Many specimens are in the museum of the Academy.

It resembles the H. analostanus in its proportions of eye and head, but is more elongate in body. The largest specimens are more than twice the size of the largest of the latter.

Hypsilepis analostanus (Girard) Cope.

Leuciscus kentukiensis Kirtl. Journ. Bost. Soc. Nat. Hist. V. p. 27 (not of Rafinesque). *Cyprinella* do. Cope, Proc. Acad. Phila. 1854, 279. *Hypsilepis* do. Cope, Trans. Am. Phila. Soc. 1866, 371. *Cyprinella analostana* Girard, Proc. Acad. Phila. 1859, 58. Cope l. c.

The dorsal and ventral outlines are regularly and gently arched from the end of the muzzle and contract to a caudal peduncle of about the depth of the head at the middle of the orbit. The dorsal region is quite compressed, the ventral narrow but not carinate in front of the vent. Eye round, contained 4·5 times in length of head, and 1·5 in length of muzzle; the latter is narrowed and projects slightly beyond the mouth, most so in males in breeding season. Oral margin arched, end of maxilla opposite middle of nares. The greatest depth of the body is greater than the length of the head, and enters the total (including caudal fin) four and one-fifth times. Tail short, deeply and concavely emarginate. Anal fin less developed than dorsal, its base nearly equal height of first ray, and just exceeding base of dorsal; latter a little over $\frac{2}{3}$ greatest elevation of the same.

General color leaden silvery, darkest on the sides, the scales above and below, a dorsal band and large spot on hinder part of dorsal fin, blackish; top of head and median margin of anal fin shaded with the same. In spring and summer the inferior fins, and even the tips of the caudal and [illegible] of the dorsal, are filled with a satin white pigment, which has a [illegible] fect, and gives the fish its local name of "Silver Fin." At the [illegible] the head and muzzle of the male are studded with small tu[illegible] a conic accumulation on the end of the muzzle, prolongi[illegible] the mandible, also over the orbit, from an agglomeratio[illegible] bone; a double series of larger tubercles on each side the fr[illegible] join between the nares and on the parietal region; scattered [illegible] poral region.

Total length 3·375 inches; caudal 5: from its base to first ray of anal 1 in.: to first dorsal ray 1·44 in.; from latter to end of muzzle 1·56 in.

This species is abundant in the various tributaries of the Ohio; it is also common in all the waters of the Susquehanna examined (Octoraro, Conestoga, Juniata, Meshoppen) and in the Potomac (Girard); from the Delaware I know it from the neighborhood of Trenton (C. C. Abbott) and Philadelphia (J. Burk), Conshehocken on the Schuylkill. From the James River, Va.

It is also abundant in the Kanawha and its tributaries, but is not known from the Holston. It is chiefly to be found in the quieter parts of river channels and back waters, being comparatively rare in creeks.

Dr. Girard described specimens of this species from the Potomac as distinct from those of the Ohio, without making comparisons. I undertook to substantiate the differences and gave the following as distinctive features of the Eastern and Western fishes:

Head 3¾ to 4 times in length to base of tail. Scales $\frac{5—(6)}{2—(3)}$ 32—5 for the Eastern.

Head 4½ times; muzzle more acute. Scales $\frac{6—7}{3—4}$ 38—40 for the Ohio type.

These represent the tendencies of the individuals of these regions correctly, but the exceptions to the rule are not rare: thus a Schuylkill specimen before me exhibits a head 4½ times in length and has an acute muzzle, scales of lateral line 38. Seven rows of scales above the lateral line in a Youghiogheny specimen, include some abnormally intercalated, but not a true series; about half the Delaware specimens exhibit six. Four rows below the lateral line has resulted from counting an elevated abdominal series. In two Ohio specimens the anal radial formula is identical with that of the eastern, 1·9, while in five the formula is 1·8. Thus this species exhibits an unusual range of variation.

Dr. Kirtland identifies this species with the *Leuciscus* (*Luxilus*) *kentuckensis* Rafinesque, but this cannot be correct, as the latter is described as having red fins, a characteristic always wanting in the H. analostanus.

Hypsilepis diplæmia Raf.

Leuciscus diplæmia Raf., Ichthyologia Opiensis, p. 50. *Luxilus* do. Kirtland. Bost. Journ. N. H. 1845, 276, Tab. *Plargyrus* do. Girard, Proc. Acad. Phila. 1856. *Hypsilepis* do. Cope, l. c. 1864.

This species has somewhat the form, as it has the coloration and minute nuptial excrescences of the species of Clinostomus; as in them, the dorsal fin commences slightly behind above the origin of the ventrals; its hinder margin is opposite the origin of the anal, to which the ventrals attain. Anal elongate, its last ray horizontal, outline behind, vertical concave. Dorsal elevated, rounded above, length of first articulated ray one-half from its base to base of caudal. Radial formula D I. 9 P. 12. V. 8. A I. 11. C.+18+. Dorsal outline elevated, superior line of cranium scarcely arched, head rather compressed: body rapidly narrowing to caudal peduncle at dorsal and anal fins. Caudal expanded, deeply emarginate.

In the breeding season minute asperities cover the dorsal line in front of the dorsal fin, and appear on the upper and lower aspects of the head. The latter are most abundant on the preorbital region; on frontal region sparse, minute. Rows on the superciliary and lower edge of suborbital regions, and two on each ramus mandibuli.

Length of head four times in length to base caudal, and less than depth of body. Scales of anterior dorsal region much smaller than those of the lateral: latter with exposed surfaces very narrow, and crested with minute tubercles in the breeding season.

Color, dusky above, the sides and belly silvery without band; below crimson

in spring. A large black spot at base of dorsal fin. Length extends to four inches, according to Prof. Kirtland; of a specimen in Museum Academy, from Lansing, Michigan, 2 inches to origin caudal; 12·5 lines to origin dorsal; 6 lines to opercular margin; depth 7 lines.

Prof. Kirtland states that it is abundant in all western streams, and that it ascends rapids in shoals in spring for the purpose of depositing its eggs.

HYPSILEPIS ARDENS Cope.

Spec. nov.

Length of head 4·33 times in total; orbit equal muzzle, its anterior border reached by the end of the maxillary; mandibular symphysis projecting slightly beyond the end of the muzzle. About 26 rows of scales in front of dorsal fin. Anterior dorsal ray opposite the middle of the ventral, the posterior opposite the first anal. The first anal nearly as long as the longest dorsal, the fin elongate, concave behind; it is nearly reached by the ventrals. Pectorals extend half way to ventrals. Cranium slightly arched transversely above; interorbital space ·25 greater than diameter of orbit. Opercular and preorbital bones deeper than long.

Dorsal region yellowish olive, the scales black edged to middle of sides, all rose shaded. Sides, belly and head rosy crimson, muzzle approaching vermillion; suborbital region purple. Dorsal and anal fins vermillion, the former black at base; pectorals and ventrals rose. Caudal orange red, black lined.

Length of largest specimen 3 in. 2·5 lines; to base dorsal 17·5 lines; latter to base caudal 14·5 lines. Depth at orbit 3·5 l.; at first anal ray 5·25 l.; at constriction caudal peduncle 3 l.

Habitat.—The head waters of the Roanoke River (in Montgomery Co., Virginia). One of the most richly colored fresh-water fishes.

PHOTOGENIS Cope.

Trans. Amer. Philos. Soc. 1866, 378.

This genus was established for species agreeing in general characters with Hybopsis, but resembling Alburnellus in dentition. The mouth is not small, the orbits and scales are large, and the form generally slender. The species frequent clear streams, are less common in swift rapids, and never occur in stagnant or muddy waters. They are ornamented with lustre almost exclusively, and do not develope conspicuous horny tubercles.

The present collection contains three new species of the genus, which are here added to the three already known:

A. Anal radii I. 10, in one species I. 9. (No black spot at origin of caudal fin.)

aa. Dorsal fin much nearer origin caudal than end of muzzle.

Scales (5) 6—39–40—3. Diameter eye equal length muzzle; 3·3 times in head; latter 4 to 4·5 in length; depth in same 5·6—5 times; above olive; sides silver, in a band on caudal peduncle. Anal radii I. 10..... P. leucops.

Frontal width three-fifths orbit. Scales 7—35—3. Orbit diameter greater than length muzzle, 2·75 times in head; depth 4·75 in length; lateral line much decurved; silvery below, fins unspotted. Anal radii I. 9..... P. ariommus.

a. Dorsal fin equidistant between origin caudal and end muzzle.

Scales 4 (5)—36–40—3. Diameter of eye exceeding length of muzzle, 2·75 times in length of head; latter 4·5 in length,* depth 5 times. Head above and edges dorsal scales blackish; sides and belly silver..... P. telescopus.

* Always to origin caudal.

AA. Anal radii I. 8.

a. A black spot at origin caudal fin.

Scales 5—38–40—3. Orbit equal muzzle, 3·3—3·5 times in length head; latter 4·5 in length. Olive scales above brown edged; sides silver, with a purple band; muzzle and base dorsal red..... P. leuciodus.

aa. No black spot at base caudal.

Head narrower. Scales 6—38—2. Orbit less than length muzzle, 3·5 times in length head; latter times in total; depth five times in same. A leaden lateral band; middle caudal and spot on dorsal black..... P. spilopterus.

Head broad, frontal width equal diameter orbit, which is greater than length of muzzle, one-third length head. Scales 5–6—38—3. Head 3 75—4 times in length; depth 4—4·5 times..... P. scabriceps.

PHOTOGENIS LEUCOPS Cope.

L. c. *Squalius* (*Clinostomus*) *photogenis* Cope, Proc. Acad. Nat. Sci. Phila. 1864, 280.

A species resembling some Alburni in its large caducous scales and attenuated form. Eye over one-third head, round. Mouth quite oblique; under jaw scarcely projecting; maxillary not reaching line of margin of orbit. Head entering four and two-thirds times into length to fork of caudal; greatest depth seven times. Back broad. Fins D. narrow 8; C. 19, A. 1—10. V. little anterior to dorsal 9. P. narrow falcate 13, extending about half-way from their origin to that of the ventrals. Scales with radii stronger than concentric lines. From base of caudal to base of first dorsal ray, equal from latter to anterior border of iris. Lateral line deflexed, rising with outline of belly at anal fin. Above pale ochre, with a median brown line, and one on each side, from opercular upper angle to tail. Sides and below bright silvery, especially brilliant on the operculum and suborbital region. Lips blackish edged. Muzzle and chin whitish. Length three inches.

This species has but five scales above the lateral line as originally described, exceedingly rarely.

Three marked varieties of this species have come under my notice, as follows:

a. Depth greater, equal from end muzzle to middle of operculum; head usually 4·5 times in length. Numerous specimens from the Kanawha, especially from Sinking Creek and near Austinville, Wythe Co., Va.

aa. Depth less, six times in length, equal from end muzzle to edge preopercle; head four times in length. Two specimens from Youghiogheny, Pa.

aaa (P. l. engraulinus). Depth one-sixth of length, equal from end muzzle to between orbit and præoperculum. Head 3¾ times in length. One specimen from Austinville, Wythe Co., Va., from a tributary of the Kanawha.

PHOTOGENIS ARIOMMUS Cope.

Trans. Am. Philos. Soc. Phila. 1866, 280.

This species resembles at first sight the Ph. l e u c o p s, but is less elongate. On comparing an example of the latter, ·25 longer, the depth of the body is the same, and the eye strikingly larger; the depth of the head the same, and the muzzle shorter.

In this fish the operculum is deeply concave on its upper posterior margin, and the inferior is shorter than the anterior; in P. l e u c o p s the former is straight, and the inferior border equal the anterior. The dark lateral line is faint or wanting in the a r i o m m u s, and there is no black vertebral band. Placed alongside of a Hypsilepis c o r n u t u s of equal length, this fish is less

and has an eye of almost double the area, besides the different coloration
;eneric features of teeth and scales.
e two and three-fifths in length head; muzzle two-thirds its diameter;
h large, mandible scarcely projecting, maxilla not attaining anterior mar-
f orbit. Frontal breadth three-fifths orbit. Pectoral fins reaching three-
ers distance to ventrals. Depth caudal peduncle one-third from middle
n caudal to opposite first anal ray. Basis of anal slightly elongate, four-
height of same, equal basis dorsal; latter equal two-thirds height of
l; last dorsal ray much less than half first, hence the outline of the fin is
oblique. Caudal deeply furcate, length equal that of head. Length from
caudal to first dorsal ray equal from latter to above anterior part of orbit,
Ph. leucops. Anal radii I. 9.
;ht olivaceous sides and below silvery, becoming a band with superior
edge on caudal peduncle. Sides of head and muzzle white.
tal length 2·875 inches; base of dorsal to superior base caudal 1·06 inches;
to end muzzle 1·19.
is species has only been found as yet in the White River, Indiana, by Wm.
ark, to whose attention I owe a single specimen.

PHOTOGENIS TELESCOPUS Cope, sp. nov.

species combining an elongate form, short head and large eye, and nearly
l to the last described.
uth very oblique (angle 60°), mandible not projecting beyond premaxillary
closed; posterior margin maxillary on line of anterior margin of orbit.
of muzzle slightly decurved, profile above nearly plane; frontal region
ransversely, the parietal region gently convex in section. Lateral line
tly deflected. Posterior dorsal ray equal less than half the anterior, and
the basis to the sixth ray. Basis of anal greater than that of dorsal, a
less than longest anal ray. Ventral fins fall short of vent, and are ap-
:hed two-thirds the intervening distance by the pectorals. P. 14. D. and
8. C. + 19+. Length of an average specimen 3 in. 6·5 lines; end muzzle
st anal ray 1 in. 11·5 lines; depth caudal peduncle at posterior anal ray
lines.
life this species is a pale sea-green, with distinct brown edges to the
s. Lateral lustre plumbeous posteriorly.
is species is very abundant in all the rapid streams tributary to the Hol-
River in Virginia. It is very rare in the river itself.

PHOTOGENIS LEUCIODUS Cope, sp. nov.

is species is allied to the P. telescopus, and may readily be confound-
th it, but the more delicate tints at once distinguish it in life, and the
er orbit strikes the eye on making comparison. As shown in the analytic
, the characters are numerous. It is the only one of the genus adorned
bright colors; they are subdued, the purple and silver of the sides re-
ling the nacre of some Uniones.
zzle rounded in profile, mandible not projecting, mouth oblique (30°),
f maxillary bone opposite margin orbit. Vertex gently convex trans-
ly. Twelve scales in vertebral line anterior to dorsal fin. Lateral line
y straight. Radial formula, except for anal, and lengths of fins as in the
species. Longest dorsal ray measures twice from its origin to above
rior margin or middle of orbit. End of muzzle and basis of dorsal fin red,
the young of Hypsilepis coccogenis.
tal length of a fully grown specimen 3 in. 1 line; length to first anal ray
lines. Depth caudal peduncle at last anal ray 3 lines.
is species is found in the tributaries of the Holston, in situations similar
ose where the P. telescopus occurs. It is, compared with the last
d, a rare fish. Numerous specimens in Mus. Academy.
.]

PHOTOGENIS SPILOPTERUS Cope.

Trans. Amer. Philos. Soc. Phila. 1866, 280.

Form elongate, less so than in the Ph. leucops; scales with the radii distinct 6—10, and the concentric lines very strong. Lateral line deflexed anteriorly. Orbit three and one-half times in length of head, equal length muzzle, and is three-fourths the interorbital breadth. Head five and one-third times in total length, equal length caudal fin. Muzzle straight above, mandible not projecting when closed, end of maxillary attaining line of orbit. Premaxillary margin opposite middle pupil. Pectorals two-thirds length to ventrals. Bases of anal and dorsal fins equal, equal two-thirds height of former, three-fifths height of latter. First dorsal ray a little nearer origin caudal than end muzzle. Rays, D. 1.8. A. 1.8. V. 7 and 8. P. 13.

Length 2·875 inches, depth caudal peduncle at middle ·19 in. Teeth in numerous specimens 1·4—4·1.

Color olivaceous, with a plumbeous band along the posterior half the lateral line; thoracic region and lower half the sides of head silvery, remainder of head blackish. Median part of caudal fin, a spot on the upper hinder portion of the dorsal, and a narrow vertebral line, black.

Many specimens of this species are in Museum Academy, from St. Josephs River, in southwestern Michigan.

This species bears a superficial resemblance to the Hybopsis plumbeolus, but apart from the difference of dentition, and the spot on the dorsal fin, this species has a smaller eye, longer ventrals, etc.

PHOTOGENIS SCABRICEPS Cope, sp. nov.

This species is readily distinguished from its congeners by its stout robust form, heavy head, and large eye, and in life by minute rugosities which cover the front muzzle and chin, but which disappear, leaving no trace, in spirits.

Front and vertex flat, upper profile plane, end of muzzle obliquely descending. Mouth little oblique, mandible as long as muzzle; extremity of maxillary opposite line of orbit. The operculum is more posteriorly prolonged than in the P. telescopus. Lateral line distinctly deflexed. Pins small, pectorals and ventrals short; radii as in the last species.

This species is not so refulgent as most others of the genus. In life it is of a bright sea-green, with an ill-defined silver lateral band, which is leaden shaded on the caudal peduncle. Dorsal streak reddish, scarcely perceptible in alcohol.

Total length 3 in. 1·5 lines; width of cranium behind 4·2 lines; length of caudal fin (equal from end muzzle to preoperculum) 5·75 lines.

This species occurs abundantly in the tributaries of the Kanawha River, in company with the Ph. leucops, especially in Sinking Creek, Walker's Creek, and near Austinville. It occurs not rarely in the main channel of the river also.

A Review of the species of the AMBLYSTOMIDÆ.

BY E. D. COPE.

This family is of particular interest among the Urodela, as furnishing connecting forms between the ordinary types of the order, and those larger species which we suppose to be more characteristic of former periods of the earth's history. It also furnishes us with transitional conditions of characters which have been regarded as indicating very diverse origin and nature. The species are mostly of large size, and are probably confined to North America; perhaps a species exists in Japan.

The characters which restrict the family are as follows:

Palatine bones not prolonged over parasphenoid, bearing teeth on their posterior margins.

Orbitosphenoid separated from proötic by membranous walls. Internal wall of vestibule membranous.

Carpus and tarsus ossified.

Vertebræ amphicœlian

Prefrontals and pterygoids present.

Premaxillaries feebly developed, distinct, but not embracing a fontanelle.

Parasphenoid without dentigerous plates.

Parietals and prefrontals prolonged, embracing frontals.

The writer characterized the family as above in the Journal of the Academy, 1866, 105. Dr. Hallowell proposed it in the same work, 1858, 337, but on insufficient characters. Many of the characters of the principal genus, Amblystoma, had been already pointed out by Prof. Baird. The genera included by Hallowell were Amblystoma, *Xiphonura* Tsch., and Onychodactylus Tschudi. Gray had previously embraced the same genera with *Heterotriton* Gray, in his first section of the Plethodontidæ, which corresponds with this family. The writer in 1859 embraced Onychodactylus, Amblystoma, *Camarataxis* Cope, and Megalobatrachus Tschudi. In the above cited essay of 1866 the genera are limited to the two first mentioned, with *Ensatina* Gray.

The full investigation of the subject results in the following disposition of these supposed genera, Baird having already shown the identity of *Xiphonura* with Amblystoma. *Heterotriton* is identical with Amblystoma. Megalobatrachus, the great salamander of Japan, I have determined to pertain to the Protonopsidæ. *Ensatina* Gray my friend St. George Mivart informs me is identical with *Heredia* Girard. If this be the case, it is established on a species of the Plethodontidæ, and one not to be separated from Plethodon. I therefore call *H. oregonensis* Girard, Plethodon ensatus, and thus we have three species* of this genus in the Pacific district, where none were previously supposed to exist. Onychodactylus most probably belongs to the Plethodontidæ, the sphenoidal teeth having been perhaps overlooked or lost; but it may be also an exceptional type of the same family. I have not seen it. The character from which it is named, and which has been regarded as part of its generic diagnosis, is probably only a seasonal or incidental one, and not likely to prove even specific. It is a common feature of the large Amblystomæ, and has no greater significance with them.

The genus *Camarataxis*, as will appear further on, was established on a larval character, permanent in some individuals, it is true, but not permanent in any species.

On the other hand, there is some probability that one or both of the species of Hynobius Tschudi, from Japan, enter the family, but this I am not able to establish.

It is important to observe the significance of the features defining this family. One only, of the eight assigned, is what may be termed a morphic character; the shortened form of the palatine bones, as compared with the posteriorly produced laminæ of the Salamandridæ, being neither assumed after possession of the latter structure, nor identical with the immature stage of the same, so far as yet known. The two families do not appear, after the brief examination we have given this point, to be developmentally related. The presence of dentigerous plates onthe parasphenoid in the Plethodontidæ is a character of the same kind.

The embracing of the frontals by the adjacent elements is a developmental feature, being characteristic of the larval condition of various families.

The membranous condition of portions of the walls of the cranium, including that of the vestibule, is a persistence of an immature stage of the Salamandridæ.

The biconcave vertebræ constitute a similar persistence of a larval feature.

* See description of Plethodon intermedius Baird, and Plethodon croceater Cope, from the West Coast, at the end of this paper.

The presence of pterygoids has the same significance with reference to other families.

The ossification of the carpus, tarsus, and of the premaxillaries, are characters in which this group develops beyond the larval condition which is permanent in the family of Plethodontidæ.

Thus of eight characters two are morphic, and six developmental; of the six, two are of advanced development, and four of repressed development, as compared with other families.

The characteristics of the genus Amblystoma, the only one of the family, are as follows:

Palatine series of teeth in the same line, though often interrupted.

Quadratojugal bone wanting.

Tongue attached by its whole base, but with a narrow free margin on all but the posterior portion.

Digits 4—5, free, not connected by natatory membrane.

A stratum of crypts more or less thickened on the parotoid region, and along the superior lateral region of the tail.

A series of mucous pores around the orbit, and for some distance anterior to it.

With respect to the caudal crypts, they are much less developed in the group of which A. t e n e b r o s u m Baird is the type than in the others.

The larvæ are characterized by the long slender processes of the three branchial laminæ, which bear the vascular fimbriæ, rather than the laminæ themselves, as in some other genera. The internal nostrils are confined between the maxillary series of teeth and the palatine arch, which is concentric with the former and near to it, and is continued backwards on each side, in line with a similar series on the pterygoid bones. A relation of nostrils to palatine teeth similar to the above is permanent in Amphiuma, and one intermediate between it and the adult condition of Amblystomæ of groups III. and IV. characterizes Protonopsis.

The tail and back have a free dermal margin, but there is none on the limbs or digits. The tail is short and deep.

The general anatomy of the larvæ is reserved for the completion of this monograph.

The following are some of the most readily observed characters which are assumed by the Amblystomæ at the period of their transformation: 1, the series of teeth on the splenial bone is shed; 2, the carpus and tarsus ossify; 3, the tail narrows and lengthens; 4, the branchiæ disappear; 5, the tongue enlarges, and covers the floor of the mouth; 6, the pterygo-palatine series of teeth becomes more nearly transverse; 7, brightly colored pigment is deposited in the chromatophoræ of the derm. These changes are stated in the order of their occurrence. But in some of the protean species this order is not exactly observed in all individuals, and in consequence of the assumption of one or the other character of maturity in advance of another, the number of species has been supposed to be greater than it is. The same irregularity in the successional appearance of structures is well known in the earlier periods of embryonic life, as stated by Von Baer in the Scholia of his Entwickelungsgeschichte. In the chick, different portions of the vertebral axis, and the abdominal plates, may or may not appear in the usual order or succession.

In Amblystoma the approximation of the period of reproduction to that of transformation varies with the species, and it is evident that, the closer this approximation under the above principle of variation, the more protean will the species be. As we know from the experiments of Hogg, Duméril and others that metamorphosis is greatly hastened or delayed by the conditions of temperature and light, what would not be the effect, on individuals of such a protean species, of a change of topographical situation, such as the elevation or depression of the land? And I have no hesitation in saying that if the peculiarities of series of individuals of A. t i g r i n u m and A. m a v o r t i u m, in the

respects above enumerated, were permanent, they would characterize those series as species, as completely as any that zoologists are accustomed to recognize. For the evidences on this head, see the discussions of those species below.

The experiments of Hogg above allnded to are as follows, as given by him in the Annals and Magazine of Natural History.

He placed a number of impregnated ova of frogs in vessels arranged at regular distances from the light, in a cave. The lessening degrees of light were of course accompanied by a corresponding, but much less rapid decline in temperature. The resulting effects on the metamorphosis may be tabulated as follows:

Mo.	Day.	Mean Fahr. 60°	56°	53°	51°
3	11	Egg	Egg	Egg	Egg
	20	Larva free.	*	*	*
	25	*	Larva free.	*	*
	31	*	*	Larva free.	Larva free.
4	10	Larva very large.	*	*	*
	22	Metam. complete.	Larva large.	Larva large.	Larva small.
8	11		Metam. compl.	*	*
	28			Metam. compl.	*
10	31				Metam. compl.

Other experiments, which will not be quoted now, are equally conclusive as to the effect of light and heat on this process.

The distinction between maturity, or adult age, and complete development, must be borne in mind. The former condition is attained when the ova are fitted for impregnation, and the spermatozoöids are capable of accomplishing that result. Development may or may not advance much beyond this period. As one or more periods in the life of every species is characterized by a greater rapidity of development (or metamorphosis) than the remainder, so in proportion to the approximation of such a period to the epoch of maturity or reproduction, is the offspring liable to variation.

The great difference between the different species, and between individuals of the same species in this respect, may be illustrated by the following comparison between the size of the animals at the time of losing the branchiæ, so far as known, and that to which they ultimately attained:

Species.	Size at loss of branchiæ. In.	Lines.	Average full size. In.	Lines.
A. jeffersonianum	1	5·75	6	
A. punctatum	1	10	6	6
A. conspersum	1	10·5	2	7·5
A. opacum	2	2	3	9·5
A. texense	2	1	?	
A. microstomum	2	3·5	4	
A. talpoideum	3	(perhaps too large).	3	9·5
A. paroticum	3	7·5 (not smallest).	7	2·5
A. tigrinum	3 to 6	7 to 7	8 to 10	
A. mavortium	3 to 8	9·5 to	8	9

In this connection it is desirable to ascertain how far characters distinguishing undoubted species fall into the line of successional changes common to all the species. An answer to this question would solve an important part of the inquiry as to the origin of species. We cannot go into it exhaustively at this time, but direct attention to these characters in the synoptic table. The following are developmental characters which distinguish known species: 1, the direction of the palatine series of teeth; 2, the length of the body and tail, as

compared with the width of the head, is greater in large and old individuals of A. tigrinum; 3, the widening of the muzzle and greater separation of the external nares; 4, the spotted, as distinguished from the uniform coloration.

Characters to which no such relation can be assigned: 1, the number of costal folds, whose interspaces correspond with the vertebræ; 2, the number of phalanges.

The complete monography of this genus being reserved for another occasion, the description of the Siredons is not now attempted. Suffice it to say that both Prof. Baird and myself have had evidence, for some time, that some species described by Prof. B. under this name, from our south-western regions, are only undeveloped Amblystomæ; and Prof. Duméril, in the Jardin des Plantes, has actually observed the complete metamorphosis of a Mexican species.*

In the following pages little more than a review of the species is attempted. Their clear discrimination has been hitherto a desideratum. Baird, in the first synopsis published, enumerates eight; Gray in 1850 catalogues ten, after we exclude some species of other genera erroneously included. Duméril likewise, including species of other genera, gives five true Amblystomæ. Hallowell, 1858, increased the number to sixteen. In the present essay, the species of the family described number nineteen, seven new ones being added. I must here express my acknowledgements to Prof. Baird, who has placed his MSS. notes at my disposal, and which I have adopted whenever they expressed the results of my own observations. Thus the diagnoses of nine of the species, and portions of those of two others, are, with certain modifications, from his pen. The materials on which the essay is based are the unequalled collections of the Smithsonian Institution, which goes beyond all others in the department of Urodela. Probably the second best collection existing, that of the Academy, has also furnished its numerous types, and many little known species, mostly described by the late Dr. Edw. Hallowell.

After the following examination of the transitional features of the species, the value of many of the supposed species heretofore described will be better estimated.

Synopsis of species.

I. Series of teeth along the external fissure of the internal nares. Plicæ of tongue radiating from its posterior portion. Parotoid glands not forming an ovoid distinct mass. Four phalanges in fourth toe.†

A. Costal grooves ten;

a. Vomerine series three.

Head broad, width 3·5 to groin; muzzle contracted. External nares much closer than internal; palatine series convex backwards; tail short, compressed; blackish-brown, grey speckled..... talpoideum.

B. Costal grooves eleven.

a. Vomerine series three.

β. No, or one indistinct plantar tubercle.

Middle series transverse or concave behind posterior margins of nares; width of head in specimens of three inches greater than one-fourth length to groin, in adult, 4·7 times; black above, with gray fasciæ; larger..... opacum.

Teeth as in the last; width of head in small specimens 3·5 to groin, in adults 4 5 times; a strong dorsal groove and longer tail; black above, with a series of round yellow spots on each side the back..... punctatum.

* See a highly interesting account of this event by Prof. Duméril, Annales des Sciences Naturelles for 1867, No. iv. p. 229.

† Vide an exception under A. mavortium Bd.

Median series of teeth convex, advancing beyond posterior margin nares; width of head much less than one-fourth length to groin; tail short, no dorsal groove; lead colored, with an inferior lateral, and usually superior series of small yellowish spots ..... conspersum.

ββ. Two distinct plantar tubercles.

Median series of teeth straight, nearly divided; external nares much closer together than internal; width of head more than one-fourth length to groin; muzzle very short; tail much compressed; blackish above, with large irregular yellow spots, confluent on sides; below yellow ..... bicolor.

C. Costal grooves twelve; mucous pores on each side the muzzle.

α. Larger species with two distinct plantar tubercles.

β. No canthus rostralis; head longer.

External nares as widely separated as inner; frontal and nasal regions very convex in transverse section; teeth in four distinct series, forming together a V, with concave sides projecting between the nares; body long, tail short; color brown ..... obscurum.

External nares nearer together than internal, on account of narrower muzzle; brown, with usually small yellow spots; brown always predominating; teeth continuous, or slightly interrupted externally ..... tigrinum.

External nares as widely separated as internal; the muzzle broad obtuse; brown yellow spotted, the yellow spots large, often excluding the ground color; teeth continuous, or slightly interrupted externally ..... mavortium.

External nares as widely separated as inner; the muzzle broad obtuse; dark brown, with vertical yellow spots on sides; teeth in four distinct series, in a nearly transverse line ..... trisruptum.

ββ. Canthus rostralis distinct; tail longer than head and body. Head shorter.

External nares nearer together than internal; muzzle obtuse, head small, width five times to groin; front convex; vomerine teeth in one series slightly convex forwards; yellow, with irregular brown bands above ..... xiphias.

αα. Smaller species. Teeth in three series. No or one indistinct plantar tubercles.

External and internal nares equidistant; width of head 4·5 to 5 times in length to groin; length of eye 2·5, or a little less in width between anterior canthus of same; tooth series transverse; lead-colored to black, with or without pale or distinct lateral spots ..... jeffersonianum.

Inner and outer nares equidistant; width of the long oval head 5·5 to 6 times in length to groin; length eye fissure 1·75 (to? twice) in width between anterior canthus of same; tooth series slightly convex; lead-colored, uniform ..... platinenum.

Nares equidistant; width of head 5 times to groin; muzzle contracted; eye fissure 1·66 between anterior canthus of same, once to nostril; median dental series convex forwards. A broad grey band on vertebral line of tail and body, expanding on occiput; sides dark reddish-brown ..... macrodactylum

II. Series of teeth extending to external fissure of inner nares; lingual plicæ radiating from behind; parotoid glands forming a distinct ovoid mass.

a. Teeth in three series (no canthus rostralis or plantar tubercles); fourth toe with three phalanges.

Nares equidistant, both approximated; median series of teeth nearly straight, short; width head 4·5 times to groin; eye fissure 1·7 times in width between anterior canthus; limbs large, toes short. Uniform brown..... .... paroticum.

III. Series of teeth not extending beyond inner line of nares; lingual plicæ radiating from behind; no distinct parotoid mass.

a. Two series of teeth (canthus rostralis distinct); no plantar tubercles; fourth toe with three phalanges; twelve costal furrows (species large).

Vomerine series transverse or directed backwards; muzzle prolonged considerably beyond nares; brown, marbled with dark brown .... tenebrosum.

Vomerine teeth in two sigmoids, which converge in advance of nares; muzzle shortly rounded from external nares; uniform black..... .... aterrimum.

aa. Two series of teeth; fourteen costal grooves; fourth digit with four phalanges.

Teeth arched, between inner nares; head one-fourth to groin (in small sp.); eye one-half width between canthus; muzzle broad, outer nearer than inner nares; brown, with a series of lighter spots on upper part of sides; below yellowish; muzzle and tail marbled with the same..... ..... texanum.

IV. Series of teeth not extending beyond inner margin of nares; lingual plicæ radiating from a median longitudinal furrow of the tongue; no distinct parotoid mass (species small).

a. Two series of teeth (no canthus rostralis); fourth toe with four phalanges.

Mandible shorter than muzzle; head elongate, width between eyes behind equal from same to nares; width of head 6·5 times in length to groin; black, with numerous narrow grey annuli on body and tail..... .... cingulatum.

Mandible longer than muzzle; head short, broad; width between eyes behind equal from same to end muzzle; body stouter; width of head 6½ to 7 times in length to groin; lead-colored, with a few grey shades below..... ..... microstomum.

AMBLYSTOMA TALPOIDEUM Gray.

Catal. Batr. Grad, Brit. Mus.; Hallowell, J. A. N. Sc. Phil. iii. 351; Baird (?) l. c. i. 288. *Salamandra talpoidea* Holbrook, N. Amer. Herpetology, iii. 117, pl. 29, 1838.

Shortest, stoutest, and most clumsily formed of all the terrestrial *Amblystomata*. Character of skin, as to glands, pits, etc., much as in *A. punctatum* and *opacum*. A row of large pores on the head, interior to the eye and nostrils, extending anterior to the latter; this passes behind and beneath the eye, reaching forward nearly to the nostrils. A patch on the cheeks above the lateral groove, and another below it, probably extending forward along the lower jaw.

The head is very broad, and larger, if anything, wider, than the body; becoming constricted at the neck. Its width is about equal to the distance from snout to gular fold (thus wider than long), and contained about 3½ times to the groin. The eyes are superior, and rather small; separated anteriorly by nearly three lengths of the orbit, about one orbit from the nostrils, which are separated about 1½ orbits. The muzzle is rather angular. The upper jaw is visible beyond the lower, when viewed from below.

The body is short, squat and depressed; there are ten costal grooves on the side.

The tail is contained about 1½ times in the rest of the animal. It is much as in *A. opacum*, but higher, though without a crest.

The digits are rather long and slender, scarcely different from those of *A. opacum*.

The palatine teeth are in a transverse series of three sections. The middle section is not interrupted along the median line. In the type it is slightly concave anteriorly, scarcely reaching to the under line of the inner nares, and behind the range of the lateral sections, which begin a little interior to the outer line of the nostrils. The middle and lateral sections are separated by the width of the inner nostril. In another specimen the middle patch is nearly straight, in another composed of two arcs concave anteriorly.

The tongue is thick, fleshy and adherent, though the edges are free at the sides; less so at the top. Its width is not more than half that of the head. The papillose portion is separated posteriorly by the extension forward of the plain basal portion of the tongue, although there is no groove, and exhibiting two prominent cornua to the tongue proper. The papillous ridges are longitudinal, and nearly parallel.

In alcohol this species is a light brown above, paler beneath, irregularly sprinkled, blotched and marbled with silvery or plumbeous gray of a lichen-like character. A carefully executed drawing, made from the specimens when alive, shows the ground color to be a dark brownish or liver black, more livid on the sides, and perhaps lighter beneath; everywhere sprinkled with the silvery-grey dots, of larger size, on the back. The upper part of the tail is of a purer brown than elsewhere, and is bordered by a series of obscure blackish spots, seen also near the lower margin; a few similar dusky spots appear scattered on the back. The iris appears to be a dark brown, without metallic lustre.

A series of specimens from Prairie Mer Rouge, La., is quite similar. Some of these appear to have just completed the change from the tadpole state, and the tail is higher, more compressed, and somewhat crested; the toes shorter and flatter; the papillose cornua of the tongue more indistinct.

Length from snout to transverse line of mouth	·30
" " gular fold	·55
" " groin	1·90
" " behind anus	2·30
" " end of tail	3·80
" of tail	1·50
Width of head	·52
Length fore arm	·46
" hind leg from knee	·56
Extent of hind legs	1·70
Greatest height of tail	·31
" width at same place	·15

Catalogue No.	No. of Spec.	Locality.	From whom received.
3906.	5	Liberty Co., Ga.,	Dr. Jones, sp. desc.
3879.	6	Prairie Mer Rouge, La.,	J. Fairie.
3972.	1	Near Cairo, Ill.,	R. Kennicott.

AMBLYSTOMA OPACUM Baird.

J. A. N. Sci. Phila., i. 283; Hallowell, l. c., iii. 351. *Salamandra opaca* Gravenhorst, Uebersicht Zool. Syst. 431, 1807; Delic. Mus. Vratislav. i. 75, tab. x. 1829. *S. fasciata* Green, J. A. N. S. i. 350, 1818; Holbrook, N. Amer. Herpetology; Storer, Mass. Rept.; Dekay, Geol. Surv. N. York.

Body swollen, thick, cylindrical, depressed. Skin perfectly smooth, although under a lens everywhere showing minute simple pores or pits connected with

the glands, which are seen everywhere in the body and tail, except perhaps in the lower part of sides, belly, and beneath the head; on the tail, however, they are more developed on the upper half. There are no regular patches of more conspicuous pores on the head and parotids, as seen in *A. punctatum*.

Head rather broad, depressed; its greatest width about three-fourths the length from snout to gular fold, and about two-ninths the distance to insertion of hind legs. Length of mouth half that to gular fold, which is interrupted on the nape. A constriction behind the angle of the mouth, with a lateral groove (or ridge) connecting the two, as in *punctatum*. Distance from snout to gular fold not quite three and a half times in that to insertion of hind leg. The eyes are moderate; the pupil circular. The general relation much as in *punctatum*.

Body nearly cylindrical, but decidedly depressed. No indication of a dorsal furrow. Eleven well-marked costal furrows, including the inguinal. There are about four pelvic furrows; those on the base of the tail are distinct for a time, but gradually become fainter.

The tail is oval or elliptical in cross section, though without any indication of a keel. It is nearly cylindrical at base, though slightly compressed; becoming more and more so to the pointed tip. It is thicker above than below, and, measured from beneath the anus, is contained one and a half times in rest of the length. The lateral groove on the tail is less prominent than in *A. punctatum*.

The digits are linear, depressed, but without any indication of web or margin. The third or longest finger is one-third the distance from its tip to the elbow (contained three times); the lateral ones are quite short. The fourth toe is longest; contained two and a half times in the distance from its tip to the knee. The third, fifth, second and first are successively shorter, or the fifth and second are about equal. The distance between the outstretched toes is contained about once and two-sevenths the length from snout to behind anus.

The tongue is thick and fleshy, as in *A. punctatum*, though larger in proportion, and filling the mouth more. The teeth are in one transverse line, in three series, much as in *punctatum*. The central is a double arc. The lateral series are not so far forward, or pass more obliquely backwards, so that their exterior end is even behind the convexity of the central series, not anterior to it. The lateral series is about half the length of the central, with a decided interval.

In alcohol the general color is a livid black. There is a dorsal series of transverse slate-colored bands, which widen at each end into a V on the back, but are more linear on the tail. These vary in number; about seven on the body, and as many on the tail. Sometimes more or less: sometimes confluent with those before and behind them; sometimes interrupted in the middle. They do not descend one-third the depth on the sides, being confined abruptly, and well defined to the dorsal region. There is a similar patch on the snout.

Total length	3·80	Length to tail	2·35
Length of mouth	·30	" of tail	1·50
" to gular fold	·53	Width of head	·45
" to fore leg	·60	Length from elbow	·45
" to hind leg	1·90	" " knee	·55

The principal difference in form and structure between this species and *A. punctatum* are seen in the absence of any dorsal furrow, and a less prominence of that on the side of the tail. The limbs are more feeble, the head narrower, the tail shorter, etc.

In specimens from Prairie Mer Rouge, 4033? the body is thicker and more clumsy, the legs weaker, the toes shorter, than in Pennsylvania specimens. The teeth, too, appear more transverse, and there is little or no interval between the middle and lateral combs.

[Dec.

Cat. No.	No. of spec.	Locality.	From whom rec'd.
3932	15	Carlisle, Pa.	S. F. Baird. Type of desc.
3940	1	Kemper Co, Miss.	D. C. Lloyd.
4100	16	South Illinois.	R. Kennicott.
3948	1	Tarboro, N. C.	Bridger.
3943	1	Meadville, Pa.	Thickstun.
3964	1	Racine, Wis.	
3924	6	Georgia.	Dr. Le Conte.
3958	1	Aux Plaines R., W. Northfd., Ill.	R. Kennicott.
4008	2	Columbus, Ga.	Dr. Gessner.
3928	1	Anderson, S. C.	Mrs. Daniel.
3927	14	Gloucester, Va.	
3962	1	Ripley, O.	P. Hoy.
3941	1	Abbeville, S. C.	J. B. Barrett.
4085	10	Grand Coteau, La.	St. Charles Coll.
3954	4	Galveston, Texas.	E. B. Andrew.
3953	1	Salem, N. C.	J. T. Lineback.
	3	Georgia.	Maj. Le Conte.
4007	116	Prairie Mer Rouge, La.	Jas. Fairie.
4920	1	Florida.	Townend Glover.
4018	1	New Orleans.	N. O. Acad. N. S.
	1	Pearl R., Miss.	R. Kennicott.

AMBLYSTOMA PUNCTATUM, Baird.

J. Ac. Nat. Sc. Phil. i. 83. Hallowell, l. c. iii. 351. *Lacerta punctata* (1767), L. Syst. Nat. ed. 13, 370, 45. *Salamandra p.* (1802) Lacep. Hist. Quad. Ov. i. 245, 314 (ed. of 1819). *L. maculata* (1802), Shaw, Gen. Zool. Amph. 304. *Salamandra venenosa* (1803?), Bart. in Daud. Hist. Rept. viii. 229 (in lett. from Raf.) *Lacerta subviolacea* (1809), Bart. Am. Phil. Trans. O. S. vi. p. 108, pl. 4 fig. vi. *S. subv.*, DeKay (1842), N. Y. Rept. 74, pl. 2, f. 36. *S. venenosa* (1838), Holb. Herp. 1st ed. iii. 105, pl. 24 (1842), 2d ed. v. 67, pl. 22. *Amblystoma subviolaceum*, Tschudi.

Body swollen, stout, cylindrical. Head depressed. Skin smooth though pitted with pores, most numerous on the tail. Of these there is a patch larger over on the parotid region, and another on the top of the head inside of the orbit and extending anteriorly in a straight line towards the nostrils, and passing backwards semicircularly behind the eye; a double row round the edge of the lower jaw; a pair on each intercostal space along the side of the body, and a row on each side of the top of the tail; the latter indicated generally by a whitish dot.

Head broad, depressed; width nearly equal to distance from snout to gular fold, and nearly one-fourth the distance to insertion of hind legs. Length of mouth, along axis of body, nearly distance from snout to gular fold, which is nearly continuous across the nape. There is a convolution behind the angle of the jaws, interrupted above and below, and a furrow connecting the two along the parotid region, and extended in a lateral line to the orbit. Distance from snout to gular fold contained 3½ times in distance to insertion of hind lip; (four times in another specimen).

The eyes are moderately large; the length of the orbit contained 4½ times in distance from snout to gular fold; about once in distance from the nostrils and about once in the distance between the two nostrils; nearly twice in distance between the anterior extremities of the orbits.

Body nearly cylindrical; perhaps slightly depressed, and swollen a little in the middle. On each side are eleven costal grooves, including unguinal and axillary ones, strongly marked, and nearly continuous above and below. The axillary is, however, quite inconspicuous. Four more of these furrows to behind the anus, where the last is confluent with the first caudal furrow.

These become less and less distinct to near the middle of the tail. There is a slight groove down the middle of the back.

The tail is oval in section, the larger end of the oval below; becoming more and more compressed to the tip, without indication of any ridge. There is a lateral indentation along the whole length, which is about equal to the distance from its back to the snout. In alcoholic specimens the tail is bent or curved, sometimes upwards, sometimes down, sometimes laterally.

The digits are nearly cylindrical, or slightly depressed, without web or margin. The third or longest finger is contained about 2½ times in the distance to the elbow. The second finger reaches to the last articulation; the fourth to the penultimate.

The fourth toe is largest, contained 2½ times in the distance to the knee; the 3d, 2d, 5th and 1st successively shorter. The distance between the outstretched hind toes is rather more than one and one-third the length to behind anus.

The tongue is thick, fleshy and attached, although free at the edges, except behind. It is about two-thirds the width of the upper jaw, nearly orbicular, though the outline of the papillose portion is a little emarginate behind. It almost seems as if the tongue were capable of closing round an object in its centre as in the hollow of the hand.

The transverse line of teeth is in the parts or combs; a central about two-fifths the width of the head, and separated from the lateral by a slight interval. The central patch is nearly straight in its middle, but the end curves a little forwards, and continuously with the lateral portion of the line, from a curve concave backwards, bounding the orbit. The inner edge of the posterior nares marks the extent of the central row of teeth. The lateral combs of teeth are about half the central.

The color of the specimen described is, in alcohol, of a dark liver brown above, abruptly light olivaceous beneath. On each side of the back is a series of nearly circular rounded spots, about the size of the orbit; about three on each side of the head, 8 or 9 on the body, and as many on the tail, where they are sometimes confluent. These spots are white in alcohol, but yellow in life. Along the sides, and more sparingly beneath, are some scattered quite small whitish spots, not very conspicuous. The legs are of the color of the under parts, not of the upper. They show some of the small light spots seen on the sides.

Total length of 3950 (1)	6·50	Tail, behind anus	3·10
" mouth	·40	Width of head	·65
" to gular fold	·82	Arm from elbow	·60
" groin	2.80	Hind leg from knee	·80
" behind anus	3 40		

In the preceding paragraph I have described a specimen from Abbeville, S. C., as a locality nearest to that whence the original of Linnæus' description was obtained. An examination of a large series of specimens from different localities shows certain differences which, however, are not of a character to indicate specific separation. Carlisle specimens have longer and more cylindrical toes than those from Louisiana.

The external appearance of the skin varies considerably with the strength of alcohol used for preservation, and probably with the season when captured. The animal when alive is perfectly smooth and lustrous, and readily exudes a large quantity of a white milky juice from the upper half of head, body and tail, or from the dark colored portion. This is due to the presence of glands closely implanted in the skin, the pores of which are sometimes quite inconspicuous, sometimes very distinct. On the tail they are much largest and deepest, and the lateral groove marks their inferior boundary, being there implanted vertically. When these pores are very full of their milky juice, and the alcohol is very strong, the contraction of the skin between the mouths of these pores gives more or less the appearance of rounded, thick-set granules,

of rather large size. This also gives rise to an apparent depression of the digits, the skin forming quite a margin.

The proportions of the body vary slightly. The tail is generally not so long as the rest of the animal, the groin being more usually nearer the middle point of the axis. Younger specimens appear to have shorter tails.

There is considerable diversity in the curve of the transverse series of palatine teeth. In nearly all more northern specimens the central row is formed of two arcs, concave anteriorly ⌣⌣, more or less continuous with the lateral, which are anterior and convex anteriorly. The two central arcs are continuous at their inner ends, forming an inverted angle at the axial line. Sometimes, however, as in most of the specimens from Prairie Mer Rouge, this central angle is wanting, and there is only a single arc or curve, concave anteriorly. In the type specimen described the central row of teeth is nearly or quite straight (which is quite apt to be the case in very large ones), while in one specimen of No. 4684 it is convex anteriorly. The transverse extent of this middle line of teeth varies. Sometimes there is quite an interval between it and the lateral, while in 3930, from New York, they are continuous, without appreciable interruption.

There are no very great variations in the pattern of coloration; generally the outer surface of the limbs is colored like the back, in which case there are one or more large rounded light spots. The under parts are generally dark-bluish; the sprinkling of small white specks on the sides and beneath varies considerably in prominence. The large dorsal spots are always nearly circular, and vary in number; generally only one series on each side.

In living specimens from Carlisle, Pa., the iris is dark brown, without metallic color, scarcely distinguishable from the pupil. The color of the animal above is a deep anthracite black, beneath dull livid. On each side the dorsal line is a series of large, nearly circular, gamboge yellow spots, somewhat symmetrically disposed. These vary from 10 to 20 from head to tail, and sometimes are larger than the eye, usually about its size. On the sides and beneath are sparingly scattered small bluish-white specks. The spots, both yellow and bluish-white, are sometimes found on the legs.

In younger individuals the yellow spots are brighter, and the black ground deeper.

Cat. No.	No. of Spec.	Locality.	From whom received.
3950	6 ♂	Abbeville, S. C.	J. B. Barrett (spec. descr.)
3936	1	Quebec.	R. Nettle.
4084	2	Grand Coteau, La.	St. Charles Coll.
3925	2	St. Louis, Mo.	Dr. G. Engelman.
	2	Lake Superior.	J. H. Slack.
3944	1	Centre Co., Penn.	S. Brugger.
3961	3	Somerville, N. Y.	
3938	7	Root River, Racine, Wis.	Prof. Baird.
4686	1	Cleveland, O.	Dr. Kirtland.
3963	6	Meadville, Pa.	
	1	Halifax, N. S.	Dr. Gilper.
4077	2	Fort Towson, Red R., Ark.	Dr. L. A. Edwards.
3942	3	Knoxville, Tenn.	Prof. Mitchell.
3929	2	Westport, N. Y.	S. F. Baird.
3930	2	Alleghany Co., N. Y.	Dr. Stevens.
3926	6	Carlisle, Pa.	Prof. S. F. Baird.
4086	2	Virginia.	W. McDonnald.
3786	1	Cleveland, Ohio.	Dr. Kirtland.
3905	62	Prairie Mer-Rouge, La.	Jas. Fairie.
4098	41	W. Northfield, Cook Co., Ill.	R. Kennicott.

AMBLYSTOMA CONSPERSUM Cope.

Proceed. Acad. Nat. Sci. Phila. 1859, 123.

This is one of the smallest species of the genus, and though less stout than

the two preceding, is more so than the A. jeffersonianum, which it resembles in general features.

Skin everywhere smooth. In some specimens only a series of pores may be traced along the superciliary region, and in a line to near the nostrils: several are on the parotoid region. The skin of the body is remarkably free from visible pores, while, as usual, the superior part of the tail is thickly studded with them.

The head is a broad oval, its width entering the length to the groin 4·5 times or a little more, and is a little over three-fourths distance to gular fold. Eye fissure equal to nostril and 1·75 between anterior angles, and a little more than distance between nostrils. The last distance is a little less than that between inner nares. Posterior canthus of eye a little anterior to canthus oris, anterior canthus opposite middle of upper lip from anterior point. Muzzle longer than chin.

Furrows behind the orbit inconspicuous, but present. Costal grooves eleven. Tail short, everywhere compressed, measuring from its origin (at end vent) to axilla or to gular fold. No marked dorsal groove.

The limbs are short, the digits long and slender. When appressed the fingers reach to the keel or beyond bases of fingers. Digits subcylindrical, anteriorly 3d longest, then 2, 4, 1; posteriorly 4, 3, 2, 5, 1. Two small tubercles on edges of sole. Expanse of outer toes equal from end muzzle to posterior canthus eye.

Teeth in three patches, the median longest, commencing opposite inner margin nares and convex to between nares or nearly so in one specimen. Tongue longer than broad, the laminar portion prolonged in two lateral bands posteriorly.

	Lines.
Length from snout to gular fold	4·0
" " groin	16·25
" " end anus	19·3
" " end tail	31·9
" of mouth on median line	3.
" fore arm and hand from elbow	3.
" leg and foot from knee	5.
Width of head	3.7

General color above leaden, below pale leaden, the latter usually bounded by the line of the limbs, but in one specimen rising as high as the line of the eye. Lower parts of sides and sides of tail more or less varied with small whitish spots, the former often in a regular line. A similar line on the upper part of the sides is present in some specimens, in others wanting. The end of the muzzle is sometimes pale marbled.

Eight specimens of this species before me confirm its validity in every respect. Specimens of the developed young of both A. opacum and A. punctatum are of considerably smaller size, and maintain their peculiar colorations, and a greater width of the head, etc.

From the appended localities from which it has been sent, the range is seen to be extensive:

No.	No. Spec.	Locality.	Donors.
		Mus. Smithsonian.	
3934	3	Carlisle, Pa.	S. F. Baird.
3918	1	"	"
		Mus. Academy.	
	1	Charleston, S. C.	Dr. Hallowell.
(Spec. descr.)	2	Liberty Co., Ga.	John Le Conte.
(Type)	1	Chester Co., Pa.	E. D. Cope.

AMBLYSTOMA BICOLOR, Hallowell.

Proceedings Acad. Nat. Sci. 1857, 215.

In the type specimen of this species, the usual supraorbital and lateral

frontal series of large pores are not discernible. In a second specimen they are well marked. In the former the skin is quite smooth, with eleven lateral grooves, and the folds of the throat and side of the head not strongly marked. The head is broad and obtuse, entering the length to the groin 3·75 times. The front convex is profile, containing the length of the fissure of the eye in its width between anterior canthus of same 2·75 times. The same measure is a trifle less than distance from same to nostril, and one and a quarter the distance between the latter. These are much closer together than the inner nares. Distance between outer margin of nares equal length from end muzzle to mid-interorbital space.

Dorsal line with a faint groove. Tail much compressed, equal from end vent to canthus oris. Body stout and heavy. The limbs are stout and the digits not elongate and depressed. The appressed limbs overlap by the length of the toes. Two well marked palmar tubercles. Third and fourth toes nearly equal, fifth a little longer than first.

Tongue large, disciform, not emarginate behind; palatine teeth in three entirely transverse series, the interruption taking place considerably inside the line of the nares. The teeth themselves are in numerous rows on each of their bony crests, presenting a brush-like arrangement. Medium series notched behind.

	In.	Lines.
Length from end muzzle to gular fold		9·75
" " to groin	2	7·2
" " to end vent	3	2·3
" " to end tail	5	10·05
" of mouth (straight)		6·1
" forearm and foot		6·75
" lower leg and foot		8·8
Width of head		8·75

Color above olive brown, below yellowish, olive shaded in the middle. The inferior yellow rises on the sides as short blotches; above them are several ill-defined yellowish spots. Parotoid region yellow, with a distinct black vertical bar. Limbs brown cross banded; tail yellow with brown spots.

The above description is taken from the type from Beesley's Point, N. Jersey, in Mus. Academy. Another specimen, 4692, from the same locality, in Mus. Smithsonian, differs in two important particulars; the palatine teeth are not brush-like, but are confined to the crest of the ridge, and the tail is a little longer than the head and body. The muzzle is rather longer and the mucous pores more numerous. It may belong to another species, as the *A. tigrinum*, which it much resembles, but its eleven costal folds are a notable peculiarity. The *A. bicolor*, though nearest the *tigrinum*, appears distinct, after a careful scrutiny of many individuals of the latter.

AMBLYSTOMA TIGRINUM, Baird.

Journ. Ac. Nat. Sci., Phila., i. 284. *Salamandra tigrina* Green, v. 116, 1825. *Triton tigrinus* Holb., N. Amer. Herp. 1842, 579, DeKay, Nat. Hist. New York. *Salamandra lurida* Sager, Am. Journ. A. S. 1839, 322. *Amblystoma luridum* Baird, J. A. N. S. i. 284, Hallowell, l. c. iii. 383. *Amblystoma episcopus* Baird, l. c. 292, Hallowell, J. A. N. S. iii. 354. *Salamandra ingens* Green, l. c. 1831, 254. *Amblystoma* Hallow. *Heterotriton* Gray.

General form very thick and massive, although the head is proportionally small in mature specimens; not as broad as the body. The skin appears quite smooth when fresh, especially when covered with its epidermis. On removing this, however, the skin is seen everywhere closely covered with shallow pits, interspersed with granule-like projections of the glands. There is an indistinct line of pores on each side of the head interior to the eye, but they can scarcely be traced elsewhere.

The parotid region is much swollen, wider than the skull, and about equal

the distance from snout to gular fold. The width of the jaws is contained about 4½ times in the distance to the groin, a little more than five to the end of the anus. The gular fold is very distinct and even overlapping. Over behind the jaws and from the eye, obliquely along the side of the head and neck, are also very strongly marked.

The eyes are moderate, not prominent; the pupil similar. They are distant from the nostrils one orbit length; separated anteriorly 2½ orbits. The nostrils are separated one orbit. There is a decided constriction at the neck.

The body is swollen and large; a little depressed at its circumference, at the widest is nine-tenths the distance from snout to groin. There are twelve well marked costal furrows, from fore to hind leg; five pelvic; the 4th and 5th uniting just behind the anus.

The tail is about equal to the distance from snout to groin; it is subquadrate at base; 1⅓ as high as wide, but becomes immediately oval in section, larger below, and more and more compressed to the lip. The edges are, however, rounded to the terminal third, where they gradually become sharp.

The legs are stout, thickened and rather short in proportion. The digits are much depressed; short, triangular in shape, tapering from the broad base to the tip, which are hardened and somewhat horny in appearance. The free portion of the longest is about one-third the total length of the limb from elbow to knee; sometimes even less. In the individuals which live on land, the digits appear longer and more cylindrical. The expanse of the outstretched toes is about four-fifths the distance from snout to groin.

The tongue is fleshy, broad, about half the width of the head, and with the outline of the papillose portion slightly emarginate behind.

The palatine teeth of this species extend across the palate very nearly from one side of the upper jaw bone to the other. The series is only interrupted along the median line; sometimes scarcely so. The line is obtusely angularly rounded anteriorly, the concavity behind reaching forward to about opposite the middle of the internal nares. The slightly convex anterior branches diverge backwards regularly nearly to the line of the inner nares, where the angle of divergence becomes still greater, and the line becomes nearly straight, or even concave, anteriorly.

There are considerable variations in the outline of the curve of palatine teeth, as will be given below.

In alcohol this species is of a dark livid blackish brown, paler beneath. On the upper surface, generally on the side of the tail and limbs, are nearly circular yellow spots, about the size of the eye, and generally sharply defined. These are much like those of *A. punctatum*, though not quite so distinct, and although a faint indication of arrangement in ten dorsal rows may be traced, yet these are less symmetrically disposed, and single ones are scattered between the others along the back. Similar scattered spots are seen along the belly, which again is bordered, as on the lower part of the sides, with larger, more quadrate spots, which are more or less confluent, giving rise to elongated blotches, overpowering the ground color. This is also sometimes the case on the belly, and almost always on the chin, or beneath the head and neck.

The rounded spots above sometimes vary considerably in size, and occasionally are almost wanting. Sometimes they are more or less confluent, in which case there is usually a predominance of yellow on the belly. In a large series of specimens, I have not observed any vertical yellow bands on the side of the tail.

In the young just perfected from the larva the upper parts are dark brown, the under parts uniform, of a brownish yellow apparently. The yellow spots next make their appearance, becoming more and more prominent to a certain age. In very old specimens the dorsal spots become indistinct, but may generally be discovered when held under water or alcohol.

Dimensions of 4691.

From snout along axial line to end of mouth	·55
" " " gular fold	1·00
" " " groin	3·50
" " " end of anus	4·40
" " " " tail	8·00
Width of head	·80
Fore arm from elbow	·80
Hind leg from knee	1·10

The largest specimen before me measures ten inches (4003, Racine). In this the tail from behind anus is as long as the rest of the animal. DeKay describes one of eleven inches in length.

Measurement of a typical specimen of the var. *tigrinum*.

4692. (1.) Length from snout to end of mouth along median line	·45
" " " gular fold	·90
" " " groin	3·10
" " " behind anus	3·75
" " " tip of tail	7·55
" of tail	3·80
Width of head	·70
Fore arm from elbow	·75
Hind leg from knee	·95
Greatest height of tail	·65
Stretch of hind legs	2·80

In this variety the most appreciable difference in color consists in the tendency to transverse or vertical bars of yellowish on the side of the tail more or less confluent.

I find no difference in form between the two series of the supposed *A. episcopum* now at hand, 3899 and 3887, and young specimens of *A. luridum*, as 3971, from Marietta, Ohio. The color above is light reddish brown, the sides a sharply defined dusky brown; the belly of a lighter shade of the color of the back. There are some very obsolete indications of whitish spots in the belly and sides. I am by no means convinced that these are not light colored varieties of *A. luridum*. I have, however, not been able to find the original specimen.

The following examination of the nature of the variation to which this species is subject, and their causes, may be added to the preceding diagnosis from Baird's MS.

The color varieties are as follows:

α. Uniform brown above, yellow below, sides darker brown; 3887, 3899, three specimens.

β. Blackish brown, with small scattered yellow spots above, and large ones on the sides; the majority of the individuals; Nos. 4003, 4097, 4691, 3974, 3895, 3966, 3983, 3970, 3950, 2971, 4692, 4706, and eight in Mus. Academy.

γ. Nearly equally and not coarsely marbled above with blotches of deep brown and bright yellow; 4059.

δ. Entirely yellow, with brown linear patches irregularly arranged; type of *A. ingens* from New Orleans; one specimen.

The above coloration varieties, it will be observed, coincide in part with those of A. m a v o r t i u m.

The conditions of preservation of immature stages in the dentition are as follows:

A. Palatine series nearly entirely transverse behind the internal nares; eight specimens, all from New Jersey, except two from Root River, Wisconsin, 4093, and one from Louisiana, 4706. All are fully developed, and many of the largest size; one of 4093 has the postnarial dental series separated on one

side. Of these, the largest example of the species is from Root river; with the other mentioned, the width of the head enters the length of the groin 4·5 times; and the tail is longer than head and body; the same relations are seen in two New Jersey specimens. Two from the latter State have the long tail, but the width of the head is only one-fourth length to groin, while one of the same have the longer body (4·5 times) but the tail shorter than head and body; two specimens have both the short body and tail. The elongation of the tail and body scarcely occurs in connection with any other type of dentition, and it is mentioned here to show the greater general completeness of development in these Eastern individuals.

B. Series slightly arched, not passing between nares. Two specimens large. In No. 3993 both outer segments are well separated from the median; the tail is longer than head and body, and width of jaws 4·33 to line of groin; this individual is aberrant.

C. Series angulated, not extending anterior to anterior margin inner nares; Nos. 3956, 2971, 3983, 3895, 3899a, embracing five specimens. Three large sp. in Academy Mus. and type of *A. ingens* Green in same.

This last specimen is peculiar in some respects, as already noted in coloration. The head is relatively a little wider than in other specimens of the same large size, the width entering the length to the groin four times, as in individuals of the smaller average size of the species. The length of the eye fissure enters 2·5 times the interorbital width, instead of twice, though in one of equal size from Root River it enters 2·2 times. The nares are not more than usually separated, hence the muzzle is more contracted than usual; it is also depressed in profile, but not more than in some other specimens. I believe it not to be a distinct species, but a form dependent on causes similar to those producing others here enumerated, and not more permanent than these so long as those causes are not universal. In other words, it is a large specimen with teeth, head and tail of adult character, but body and muzzle more larval. The fold on the hind leg and outer toe, mentioned by Green, is not marked, or different from that seen in the species generelly.

No. 4097, sixteen specimens from W. Illinois, two have the series divided into four; 4093, two sp.; No. 4691, Cook Co., Ill., thirty-four specimens, one has the three interruptions, and five, with one of 4093, a median, making two series of teeth.

Of series C, the tongue is of normal size and the branchiæ absorbed, except in twelve specimens, No. 4691, of which five present stumps of the branchiæ; and two, 4097, where both the tongue is very small and the gill stumps remain. The width of the head is ·25 to groin, and the tail never longer than head and body.

D. Median series arched, extending anterior to anterior margin of inner nares. One specimen, 3966, is fully developed in all other points.

E. Palatine series angulated, extending anterior to inner nares' anterior border. Nos. 4057, 3974, 3070, two of 4093, 3887, 3897b, four of 4097, nine of 4691. All of these have the short head and tail given in the preliminary diagnosis. The small or larval tongue occurs in one of 4093, 3070, 3974, nine of 4691, two of 4097; branchial rudiments remain in two of 4097, and nine of 4691. No. 4057 is remarkable in having a very small tongue and short deep tail, no stumps of branchiæ, and brilliant coloration, with large size and general adult appearance. It compares with certain specimens (4693, 3984), of A. m a v o r t i u m in this strong retention of some larval characters, and like them is from northern Minnesota, a region noted for its cold and late seasons.

Measurements of No. 4057.

Length of snout to end of gape of mouth			·55
"	"	gular fold	1·00
"	"	groin	3·50
"	"	behind anus	4·30

Length of snout to end of tail (about)	8·55
" of tail about	4·25
Depth of tail (at end vent)	1·95
Width of head	1·00
Fore arm from elbow	·90
Hind leg from knee	1·10
Stretch of hind leg	3·40

A specimen entirely similar except in size and coloration, was found by Dr. Horn, near Beesley's Pt., New Jersey, a well known locality for the species. The tail is remarkably thick and deep at the base, and only equal from its basis to the canthus of mouth. A groove in the dorsal line behind, tail not grooved. The color is a dark leaden brown, sprinkled everywhere with small yellow spots; spots large, on tail; belly yellowish. Total length 6 in. 5 l.

From the preceding investigation we gather that larval characters in this species are in part only cotemporaneous; that the branchiæ are lost first, the tongue develops next and the teeth last. That the development extends in older age to the lengthening of the body and tail. That the progress may be arrested at a time when different degrees of combination of these and other features exist. That reproduction may take place at any of such different stages, is evident from the condition of development of the ova of many of the various specimens; and it is known to take place in other species at earlier stages than any recorded here as adult.

It is also to be noted that specimens from New Jersey are almost always more fully developed than those from the western regions; the former is a warmer district than the latter. Of two specimens from New Orleans, however, one only exhibits the dentitional characters of the New Jersey individuals. The characters common to the western individuals have occasioned the opinion that it was another species, which was called *A. luridum*.

Axolotls, or reproducing Amblystoma larvæ from Mexico, have recently reproduced in the Garden of Plants, as before stated, and the offspring have lost most of their larval features remarkably early. Prof. Duméril finds the teeth of these specimens to resemble those of the supposed *A. luridum*, and adds that they may belong to that species. This is not probable from the habitat. The A. mavortium extends into Northern Mexico, as far as the limits of the Fauna Nearctica, and it is more likely to prove to be this species.

It must be observed that this large species, whose description follows, differs absolutely only in the broader muzzle, and wider separation of the outer nares. The A. tigrinum retains in this case a feature characteristic of the larva of A. mavortium and of all other Siredon species. The range of color variation is only partly different in the two, but the majority of specimens of each belong to different color types. Each occupy a different geographical area, both of which are well marked in the distribution of many other reptiles. Nevertheless, ultimately I think it quite possible that they will have to be viewed as developmental forms like so many other supposed species, which are not sufficiently isolated from one another at the present time to warrant them distinct places and names in the system.

The Siredon of the Table Land of Mexico is different from those of the species described in this essay, as already pointed out.* As the metamorphosed stage, if existing, has not yet been obtained, I introduce it into this synopsis by name only.

Cat. No.	No. of Spec.	Locality.	From whom received.
3979		Detroit.	Dr. A. Sager (type of *A. luridum*).
4691	40 (ad.)	W. Northfield, Ill.	R. Kennicott.
4097	30	N. Illinois.	
4003	6	Racine, Wis.	Dr. Hoy.
3983	1	Rock Island, Ill.	J. D. Sergeant.

*Proc. A. N. Sci., Phil., 1866, 300.

3992		2	S. Illinois.	R. Kennicott.
3974		4	Columbus, O.	L. Lesquereaux.
3971		1	Marietta, O.	Prof. Andrews.
4706		2	Grand Coteau, La.	St. Charles College.
3966		2	Mississippi.	Dr. Shumard.
3956	(30)	1	New York.	J. C. Brevoort.
3895		1	St. Louis.	Dr. Engelman.
3993		1	Russellville, Ky. (1852)	Dr. Geo. R. Bibb.
4040		2	Lake Encenito, Ill.	J. Potts.
3899		2	Detroit, Mich.	Dr. A. Sager.
3887		1	Ann Arbor, Mich.	S. F. Baird.
4707		1	Racine,	S. F. Baird.
4059		1	Fort Ripley, Minn.	Dr. J. F. Head.
4692		3	Beesley's Pt., N. J.	S. F. Baird.

AMBLYSTOMA MEXICANUM Cope.

Gyrinus m. (1800?) Shaw and Nodder, Nat. Misc., pl. 342, 343. *Siren pisciformis* (1802?) Shaw, Gen. Zool. Amph., p 612. *Siredon axolotl* (1833) Wagler, Jones' Amph., pl. 20; Axolotl (1811) Cuv., Rept. dout. in Humb., Obs. Zool. 104, pl. 14. *Hypoethon pisciformis* (1829) Gravenhorst, Del. Mus. Vratislav., p. 89. *Acholotes guttatus*, (July, 1844,) R. Owen. Ann. and Mag. Nat. Hist. xiv., p. 23.

? Lakes, City of Mexico. Dr. C. Sartorius.

4. Table Land, Mexico.

AMBLYSTOMA MAVORTIUM Baird.

Journ. Ac. Nat. Sci. Phila. 1847, 292.* Hallowell, l. c. iii. *A. proserpine* Baird. Hallowell, l. c. 354. *A. maculatum* Hallowell, l. c. 355, Proceed. 1857, 215. *Cumarataxis maculata* Cope, Pr. Ac. Nat. Sci. Phila. 1859, 122. *A. nebulosum* Hallowell, Sitgreave's Rep. Zuni and Colorado, J. A. N. Sci. iii. 352. *A. californiense* Gray, Proc. Zool. Soc. London, 1853, 11, Tab. *Desmiostoma maculatum* Sager, Peninsular Journ. Medicine, 1858, 428.

Palatine teeth in a transverse series, more or less angular anteriorly; reaching to the posterior border of the inner nares, or one diameter beyond. The angle sometimes flattened or rounded. The series scarcely or not at all interrupted on the median line; never (?) on the limbs, which are generally a little undulatory.

Inner nostrils separated by the same space as the outer.

Tongue broader than long; more than half the width of the head; thick and fleshy.

Body very heavy, with 12 costal furrows. Head very broad, contained about 3½ times in distance from snout to groin. Tail about equal to the same distance, much compressed from the base. Males in breeding season with a distinct fin from near the base of the tail above, and from beyond the middle below; tail more oval at other seasons. Cloacal region of male much swollen, emarginate—angular behind.

Legs moderate; digits much depressed, very broad at base; triangular, and adapted for swimming. Free portion of digits about one-third the distance from their tips to elbow or knee.

General color dark brown or blackish; in alcohol varied with blotches of yellow. These are disposed along the median line of the back and tail (extending down on the sides) as transverse ellipsoid bands of large size, perhaps equal to the space between the costal grooves. The blotches of opposite sides sometimes alternate, sometimes are opposite, and are frequently confluent here and there, which is generally the case on the tail, where they form yellow, encircling rings interrupted below. Along the sides of belly and lower part of the sides is a similar series of yellow ellipses, but usually larger; those of the same side usually somewhat confluent, sometimes entirely so, leaving a dusky central line of the belly. The limbs are blotched black or yellow.

[Dec.

The yellow sometimes predominates so as to almost form the ground color, encroaching largely, too, on the yellow of the belly. In general, however, there is little or no tendency to anastomosis or reticulation of the dark interspaces as in an allied species. Smaller rounded irregularly scattered spots of yellow are seldom if ever seen as in *A.* var. *luridum.*

The ground color is sometimes uniformly dusky above, although the lighter transverse ellipsis can usually be made out; perhaps they are always appreciable in life.

In the preceding general description I have endeavored to represent the distinguishing features of what I believe to be a single species, varying very much in shape of palatine teeth, proportions, color, etc. From the synonymy it will be seen that I combine under the oldest name of *mavortium*, *proserpine*, and *nebulosum.* Although the type specimens of these supposed species differ sufciently among each other, yet there are sufficient connecting links in the large series before me, and it would be no difficult task to pick out a dozen more specimens each as distinct from each other and the above as the latter are among themselves.

One great source of the diversity of character in different specimens of this protean species is to be found in the very different size of specimens in the same stage of growth, while in some the full metamorphosis will have been accomplished with a length of three or four inches; in others the branchiæ are still visible at a much greater size. In one female specimen of 8 inches in length (4978) the branchiæ are still appreciable, the fissures in the neck not being closed up, although the ovaries and oviduct would indicate that it was captured when in full breeding condition. This embryonic tendeney is almost always indicated further by shorter gape of the mouth; the tongue smaller, flatter, more adherent, not at all or very little free at the edges, and little or not at all papillose, but exhibiting a cartilaginous surface. The palatine teeth in the embryonic state are alone usually more arched anteriorly; more or less parallel with the maxillary series; less prominent above the soft palate, and extending to a less distance laterally. The digits are more depressed, their outlines more oval than triangular, the 3d and 4th toes and 2d and 3d fingers more nearly equal.

The development of the different embryonic conditions may be carried on very unequally in different specimens, so that it is very unsafe to base specific characters upon small individuals, or even upon large ones in which there is the slightest indication of the branchial slits or their tufts.

The same adult individual differs, too, in different seasons. While some species appear to reside almost entirely in water, others do so only partially. Even the same specimen may pass a more aquatic life in one year than in another. A more persistent residence in water is shown by the broader and more depressed digits, higher and more compressed tail, and more or less decided ridge (sometimes even membranous). I have no doubt that an animal, while possessing these features in marked degree when in the water, would lose them to a measurable extent after a lengthened residence on land. This aquatic habit is generally greatest during the breeding season.

The preceding diagnosis and remarks are taken entire from Prof. Baird's manuscript. I will further extend and illustrate the same, and add that the names *A californiense* and *A. maculatum* have been applied by Gray and Hallowell, and *Desmiostoma maculatum*, by Sager, to forms of this species.

Various changes of form during the late metamorphosis of this animal have been already enumerated in the prefatory remarks on the genus. A feature of difference mentioned above, the varying length of the fourth digit, appears to be quite independent of other developmental conditions. In a specimen in the Mus Academy, from Kansas. this digit has but three phalanges on both feet; in another from the same locality 3 on one, 4 on the other foot, and the same occurs in No. 3994 Mus Smithsonian. In *all* the other specimens at my disposal they are, as in this section of the genus, 4—4.

The varieties of this species, which may be distinguished by their coloration are as follows:

α. (californiense.) Blackish, with slightly paler belly; a series of large oval yellow spots on lower part of side and tail (in one specimen a few on each side of dorsal line). System of mucous pores well developed, especially below ramus of the jaw on each side. From California only; eight specimens; No. 4081.

β. Brown, yellowish below; larger lateral and smaller dorsal yellow spots, irregularly arranged. Fewer mucous pores on each side the gular region. Fourteen specimens; mostly from Kansas and Nebraska, one from Missouri, one from lat. 38°, two from New Mexico, and two from Chihuahua. Nos. 4065, 4040, 3955a, 4062, 4084, 4908, 3984a. The type of *A nebulosum* belongs here. There is no material difference between this and the coloration of A. tigrinum.

γ. Ground brown, crossed by transverse yellow bands, which inosculate more or less on the dorsal region, so as to obscure, sometimes almost entirely, the ground; mucous pores as in the last; belly with a median dark or black band. Sometimes the yellow is shaded with olive. Nos. 4613, 4705, 3990, 4703, 4694 to '99, 3955, 4078, 4079, 4066, 3982, 5359, 4082, 3994. No. 4020 might be assigned to either *β* or *γ*.

δ. Ground olive, with numerous small brown spots; otherwise as above. No. 4693 and the type of *A. maculatum* in Mus. Academy.

ε. Brown above, yellowish below; otherwise as above; 3984b, 4702, 3992, 3955b; from most diverse localities.

ξ. Color as in *γ*, the yellow leaving only inosculating lines of brown; no frontal, nasal or mandibular series of mucous pores; 4698 one specimen

So much to the principal of ornamental variation; the following are the forms resulting from unequal development of parts; the reader will observe by the numbers how partially they coincide with each other and with the preceding.

Type A. Palatine teeth in a gentle arch convex forwards, not extending between nares; the teeth (but not the ridge) interrupted inside the series behind the nares. Nos. 4908 and 5359 (2 sp.); in all respects fully grown, the former not more than half the size of the usual type. Approach distantly A. trisruptum Cope.

Type B. Palatine teeth forming a straight series on each side, meeting at a more or less open angle between the nares. Most of the specimens: Nos. 4702, 3992, 4705, 4613, 4065, 4040, 4698, 3990, 4703, 4694 to '99, 4081, 3955, 4079. Of these the angle of the tooth series does not extend beyond the anterior margin of the nares in twenty-six specimens, of which one exhibits a small, undeveloped tongue, and none have the stumps of the branchiæ remaining In eleven specimens the angle extends beyond this point (in 3990 and another approaching an arch in form); and of these the tongue is small and larval in six, and in one of these stumps of the branchiæ remain; this last is of medium size only, but Nos. 4693 and 3694 are large, the first very large; they add the larval character of a short, deep tail. It is to be noted that these specimens are from Minnesota and the borders of British America, regions subject to great cold, to which cause we may, with much probability, assign their characters. Two individuals presenting the same peculiarities are described under the head of A. tigrinum. Of two specimens from Chihuahua, fully developed, the teeth are of the two types: of eight from California one presents the second type only; it is otherwise fully developed.

Type C. The postnarial portion of the palatine series has nearly or quite assumed its transverse position, while the median series remains in its larval arch, extending more or less in advance of the nares. Eight specimens, four of the largest size: 3955a, 4078, 4062, 4084; two Mus. Academy, one type of *A. maculatum* Hall. Of these two have the small tongue and traces of branchiæ, while four are fully developed in these respects.

Type D. Palatine series forming a parabolic arch from one extremity to the

other, extending in advance of the nares. Three specimens, two of them of full but not large size; one of the former full double the size of others from the same locality (the Platte Valley), which are referred to Types C and B, has larval tongue and branchial stumps. The others, 4066, with larval tongue, but the branchiæ absorbed.

Here may be mentioned a remarkable specimen, 3982, which is in all other respects fully developed, where the larval arch of teeth remains, but has become open and slightly transverse, extending but little beyond the anterior margin of the nares. It is intermediate between Types D and A, and is the result of a retardation in development of the larval arch, while Type B is produced by a retardation or preservation of the oblique lateral series of the larva, at the expense of the arch.

I add here a description of the var. californiense, for the sake of determination of varieties and species that may be found hereafter.

The proportions of this variety and general character of the glands, pits, etc., appear much like those of *A.* var. *luridum*, in some respects of A. punctatum. I do not detect any patches of large pores on the top of the head and neck in one specimen, but in another a series of large whitish dots beneath the epidermis seems to indicate their presence. Of these one patch is placed on top of head within the orbit; another on the parotid region. Some pores, however, are distinctly visible behind the angle of the mouth, sending forward a series along the margin of the lower jaw, under the chin.

The head is broad but also long, the width being decidedly less than the distance from snout to gular fold. The gape is very large, the length nearly two-thirds the width. The width in seven specimens is contained $4\frac{1}{2}$ times in the distance from snout to groin; in one specimen four times only. The eyes are separated only by $2\frac{1}{2}$ lengths of the orbit.

The tongue is very large, nearly filling the whole lower jaw. It is three-fourths the width of the head.

There is quite a difference in the character of the palatine teeth of the ten specimens before me. In both the central part of the series forms a decided V; the angle sharp, and reaching to the line of the anterior margin of the inner nostrils. The limbs extend backwards slightly in an S shape to a short distance behind the inner nostrils and in line with their inner border, and then connect with the external segment of the palatine series, which extend (nearly transversely but a little oblique backwards) to a line with the outer margin of the inner nostrils. In both specimens the two sides of the palatine series are not symmetrical and of unequal length, one specimen showing a distinct interval between the central V and the lateral segment, as well as at the angle of the V; in the other these four elements are continuous.

There appear to be 12 costal furrows. The tail is compressed but not high; in one specimen it is as long as head and body; in another shorter; shows a sharp ridge above from near the base and from the terminal half below in one specimen; not so much in another. The limbs are well developed; the digits depressed and triangular, but less so than in many aquatic *Amblystomata*, as *A. luridum*.

The color of the species is blackish in alcohol, rather paler below. On each side of the belly or lower part of the sides of body and tail is a series of bright sulphur yellow spots, mostly nearly circular, sometimes oblong, and varying in size, though generally larger than the orbit. The spots are few in number—five or six from head to tail, and four or five on the side of tail.

In one of the specimens are some smaller rounded spots on each side of the dorsal line; three or four in each series; these are not symmetrically disposed, as in *A. punctatum*.

As Dr. Gray remarks, this species has a certain resemblance externally to *A. punctatum*, which, however, never exhibits the series of spots on the side

of belly and lower part of sides of body and tail, the spots being confined to the vicinity of the median line above. In var. *californiense*, when dorsal spots occur, they are less regular, though of much the same size. In var. *luridum* the yellow spots are much smaller, more numerous and more scattered; very prominent on the belly. There are many essential differences in form from *punctatum*, as the more widely separated external nostrils, the anterior angle of the palatines, the depressed short digits, more compressed and sharply ridged tail, etc.

A description of a specimen of color var. γ may also be useful for reference.

The form is very heavy and clumsy; the head very broad; the gape twice as wide as long. The inner nares are about as far apart as the outer. The gular fold is very distinct and overlapping; the neck much constricted.

The body is very large. There is no dorsal groove distinctly evident.

The tail is much compressed, and elevated. In the specimen selected there is a sharp ridge above and below, near the tip.

The limbs are rather short; the digits very broad at the base, triangular, and much depressed. There is little appreciable difference in the length of the third and fourth toes.

The tongue is very broad, wider than long, filling the rami anteriorly, and considerably more than half the width of the head.

The palatine teeth form a nearly continuous series, nearly straight, but slightly obtuse anteriorly where it reaches to the line of the posterior border of the inner nares. Laterally the series extends one diameter of the inner nares beyond their outer margin. The limbs of the very obtuse V are not straight, but slightly bow-shaped. There is a slight interruption along the median line.

The ground color is purplish-black, with transversely elongated blotches of yellow. These appear to be arranged in one dorsal series on each side the median line of the back (coming up to it, and the opposite ones sometimes confluent), and another on the side of the belly of larger size, and ascending high on the sides. The latter are sometimes more or less confluent on the same side. The central region of the belly is generally of the dark ground color. There may be six or eight of these blotches from head to base of tail, and as many on the side of the tail, where, indeed, they generally form yellow rings, interrupted below. The limbs are blotched black and yellow in about equal proportions.

Professor Sager has described, with considerable care, a branchiate salamander, as given in the synonymy, which I think is a larva of this species. His description points out sundry details of its external and internal organization, which do not differ from those noticed in this species.

In the same connection it may be mentioned that Prof. Van der Hoeven has recently described a "perrenni branchiate," which becalls *Sirenodon*, which appears to correspond with the larva of Spelerpes, while Necturus* is identical with that of Batrachoseps.

Proportional dimensions.

Specimen 4081. Var. *californiense*. Petaluma. Soft sp.

Width head, to distance from snout to gular fold	1¼
" " " groin	4¼
From snout to gular fold, contained in distance from snout to groin	3¼
" " " " behind anus,	4¼
Distance anteriorly between eyes, in length of orbit	2¼
" from eyes to nostrils " "	1¼
" between external nostrils, " "	1¼
" " internal " " "	not 2
Width of tongue, to width of head	¾

* See Journal A. N. S., 1866.

Free portion of longest finger contained in distance from elbow to tip, not quite 3
" " toe " " knee to tip..... 3
Length tail from behind anus, to rest of animal..... less.

Measurements.

Length (measured along axis of body) from snout to gape	·40
" " " " gular fold	·85
" " " " armpit	1·25
" " " " groin	3·00
" " " " behind anus	3·75
" " " " end of tail	6·20
Width of head	·70
" tongue	·45
Length of orbit	·18
Distance between eyes anteriorly	·40
" " outer nostrils	·30
" " inner nostrils	·30
" " armpit and groin	1·75
Height of tail where highest	·30
Breadth " "	·18
Free portion of longest finger	·28
From elbow to tip of longest finger	·80
Free portion of longest toe	·30
From knee to tip of longest toe	·90
Distance between outstretched toes	2 85

Proportional dimensions.

Specimen 3955 (1). Var. *mavortium*. Fort Bliss.

Length of gape of mouth, to its width	½
Width, to distance from snout to gular fold	equal.
" " " " groin	cont. 3½ times.
" " " " behind anus	4½ "
From snout to gular fold, contained in distance from snout to groin	3½
From snout to gular fold, contained in distance from snout to behind anus	4½
Distance anteriorly between eyes, in length of orbit	3
" from eyes to nostrils " " "	1+
" between external nostrils " " "	nearly 2
" " internal " " " "	2¼
Width of tongue, to width of head	rather more than ½
Free portion of longest finger contained in distance from elbow to tip	3
Free portion of longest toe contained in distance from knee to tip	nearly 4
Distance between outstretched toes in length from snout to groin	once.
Length tail from behind anus, to rest of animal	nearly equal.

Measurements.

Length (measured along axis of body) from snout to gape	·60
" " " " gular fold	1·00
" " " " groin	3 50
" " " " behind anus	4·50
" " " " end of tail	4·00
Width of head	1·05
" tongue	·55
Length of tongue	·45
" orbit	·22

Distance between eyes anteriorly	·65
" " outer nostrils	·40
" " inner "	·45
Height of tail where highest	·75
Breadth " "	·45
Free portion of longest finger	·30
From elbow to tip of longest finger	·95
Free portion of longest toe	·32
From knee to tip of longest toe	1·15
Distance between outstretched toes	3·50

Proportional dimensions of

Spec. 4082, type of var *proserpine*. Tamaulipas.

Length of gape of mouth, to its width	more than half.
Width, to distance from snout to gular fold	not quite equal.
" " " groin	nearly 4.
" " " behind anus	4½+
From snout to gular fold, contained in distance from snout to groin	3½
From snout to gular fold, contained in distance from snout to behind anus	4
Distance anteriorly between eyes, in length of orbit	3
" from eyes to nostrils " "	1
" between external nostrils, " "	2 nearly.
" " internal " " "	2 "
Width of tongue, to width of head	more than half.
Free portion of longest finger contained in distance from elbow to tip	3 times.
Free portion of longest toe contained in distance from knee to tip	3 times.
Length tail from behind anus, to rest of animal	less.

Measurements.

Length (measured along axis of body) from snout to gape	·34
" " " gular fold	·60
" " " armpit	·90
" " " groin	2·00
" " " behind anus	2.40
" " " end of tail	4·10
Width of head	·52
Distance between eyes anteriorly	·32
" " outer nostrils	·23
" " inner nostrils	·24
Height of tail where highest	·25
Breadth " "	·12
Free portion of longest finger	·20
From elbow to tip of longest finger	·60
Free portion of longest toe	·19
From knee to tip of longest toe	·61
Distance between outstretched toes	1·75

Proportional dimensions of

Spec. 4696. Cimarron R.

Length of gape of mouth, to its width	about one-half.
Width, to distance from snout to gular fold	equal.
" " " groin	4
From snout to gular fold, contained in distance from snout to groin	4

From snout to gular fold, contained in distance from snout to behind anus..... nearly 5.
Distance anteriorly between eyes, in length of orbit..... 3
" from eyes to nostrils " " ..... $1\frac{1}{3}$
" between external nostrils, " " ..... nearly 2.
" " internal " " " 2
Width of tongue, to width of head..... little over $\frac{1}{2}$.
Free portion of longest finger contained in distance from elbow to tip..... $3\frac{1}{4}$
Free portion of longest toe contained in distance from knee to tip ..... $3\frac{1}{2}$
Distance between outstretched toes in length from snout to groin ..... about equal.
Width of body compared with that of head..... equal.

Measurements.

Length (measured along axis of body) from snout to gape..... ·55
" " " gular fold..... ..... 1·00
" " " armpit..... 1·55
" " " groin..... 3·90
" " " behind anus .... 4·75
" " " end of tail..... 8 75
Width of head..... 1·00
Length of orbit .... ·20
Distance between eyes anteriorly..... ·56
" " outer nostrils..... ·35
" " inner " ..... ·36
Circumference of belly. ..... 3·75
Distance between armpit and groin..... 2·25
Height of tail where highest..... ·70
Breadth " " ..... ·40
Free portion of longest finger..... ·27
From elbow to tip of longest finger..... ·95
Free portion of longest toe..... ·32
From knee to tip of longest toe. ..... 1·25
Distance between outstretched toes..... 3·55

Cat. No.	No. of spec.	Locality.	From whom received.
3990	1	New Mexico.	Dr. J. Le Conte, type of spec.
4084	1	" "	" "
4702	1	San Francisco Mts., Nev.	Capt. Sitgreaves, type of *A. nebulosum*.
3955	5	Fort Bliss, N. M.	Dr. S. W. Crawford.
4065	1	Mimbres R.	Dr. Webb.
4078 (35)	1	Fort Thorn.	Dr. Henry.
4705	1 ♂	Fort Union, Neb.	Dr. Hayden.
4066	1	Rock Creek, K. T.	Lt. Bryan, W. S. Wood.
4079	1	Fort Benton.	Dr. Hayden.
4062	1	Rocky Mts.	Capt. Beckwith.
4698	1	Bridgers Pass.	Lt. Bryan, W. S. Wood.
4011	1	Sand Hills of Platte.	Dr. Hayden.
3982	1	Ft. Pierre.	Th. A. Culbertson.
4020 (84)	2	Fort Laramie.	Dr. Hayden (*proserpine?*).
4695		Fort Riley.	Dr. W. A. Hammond.
4694 (2)	♀	Mo. of Cimarron.	J. H. Clark.
4697 (365)	♂	Lower Platte.	Dr. J. H. Cooper.
4696	♂	N. Fork of Canadian.	J. H. Clark.
4699		Cimarron R., near Salt Plains.	"
4062 (91)	3	Tamaulipas.	Dr. Edwards, type *proserpinæ*.

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4057	1	New Mexico.	Ed. Kern.
3984		Lac qui Parle, Minn.	S. R. Riggs.
4093		N. Red River, H. B. T.	C. Cavileer.
4081	2	Petaluma, Cal.	E. Samuels, soft spec. desc.

Numerous specimens from near San Francisco in Mus. Compar. Zoology.

AMBLYSTOMA OBSCURUM Baird.

M. S. Species nova.

In the greatly corrugated condition of the present specimen, it is impossible to make out any satisfactory description of the integuments. They, however, appear much as in the other stout aquatic species. The head is very broad, and the gape unusually large. The internal nostrils are very large; their width half the diameter of the eye; the distance between their inner borders is the same as that between the outer. The tongue is large, broader than long; its width about two-thirds that of the upper jaw.

The palatine teeth are in four series collectively, forming a broad inverted V; the angle is anterior, and would be quite sharp but that there is an interruption along the median line. The branches reach as far forward as the anterior border of the inner nostrils. They are decidedly concave antero-externally. The two inner anterior sections of the palatine series are each about twice the length of the external ones; they fall short of the inner border of the inner nares by nearly a diameter of the latter, which space separates them from the outer section, which, immediately behind the inner nares, are about as long as the latter are wide, and do not pass exterior to their outer border.

As nearly as can be ascertained, there are twelve costal furrows. The tail is compressed, but not high.

The color appears to have been of a uniform brown above and on the sides; brownish-yellow beneath; on the sides, darker vertical blotches can be detected in the single specimen before me; similarly indistinct markings are visible on the tail.

The very convex frontal region, and the concave interrupted series of teeth alone distinguish this species from the A. mavortium of the brown variety. It differs from A. tigrinum in much larger inner nares, and more widely separated nostrils; the inner borders of the two being at about the same distance, instead of having the latter more approximated. The tongue is wider, as well as the head. The teeth are more V-shaped, reach farther forward; the outline of the limbs of the V is concave antero-externally, and interrup'ed by spaces equal to the wide nostrils; the outer sections not extending beyond the nostrils.

Measurements.

	In.	Lin.
Length (along axis) from snout to gape		7·8
" " " gular fold		12.75
" " " axilla	1	8·75
" " " groin	4	1·15
" " " behind vent	5	0·15
" " of tail	3	2·
" from elbow to tip of longest finger		12.75
" " knee " " toe	1	4·5
Width of head at angle jaw		10·9
" between eyes anteriorly		6·1
" " external nares		4·5

No.	No. of spec.	Locality.	From Whom.
3994	1	Fort Des Moines, Iowa.	W. E. Moore.

AMBLYSTOMA XIPHIAS Cope.

Spec. nov.

The specimen selected as the type of the description has the skin somewhat

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altered by alcohol, so that an exact description cannot be made of the glands, pits and pores. There does not, however, appear to be any material difference from A. tigrinum in these respects.

The head appears small in proportion to the size of the animal, and the cheeks unusually swollen; the width of the head is contained five times in the distance to groin. The mandible projects beyond the end of the muzzle. The eyes are rather small, distant three lengths of the orbit. The inner nostrils are considerably more distant than the outer. The tongue is large and fleshy, filling the rami anteriorly, and more than half the width of the head. The inner nostrils are quite lateral.

The palatine teeth form a very obtuse angle anteriorly, reaching to about opposite the middle of the inner nares, and extending laterally beyond them by about one diameter. There is a slight interruption along the median line, but no appreciable one elsewhere. The limbs of the V are not straight, but form a double curve (scarcely appreciable) on each side.

There are twelve costal grooves; others are not appreciable, except those at the base of the tail.

The tail is very long, considerably exceeding the rest of the animal; much compressed from the base, though not elevated. Oval in cross section, and only becoming sharp near the tip, without any crest. No grooves are visible along dorsal or ventral outline.

There do not appear to be any peculiarities in the feet distinguishing it from other aquatic *Amblystomas.*

The color of this species is a yellowish-olive; brighter yellow beneath, with more or less anastomasing or reticulating bands of well-defined brown on the back and sides, and a few rounded spots of the same on the belly. These bands in width average perhaps the diameter of the eye, though variable in this respect.

Compared with A. tigrinum this species has a proportionally smaller head, much longer tail, and different color; yellow predominating in the one, and brown in the other. The relationship, however, appears to be very close. The digits perhaps are narrower, though also triangular and depressed.

A large *Amblystoma mavortium*, No. 4705, from Fort Union, at the mouth of the Yellowstone, with the same coloration as the preceding, differs in rather shorter tail, the ridge of which is more acute; broader toes; and a considerably broader and otherwise different head, the width of which is contained about four times in distance from snout to groin, not five times. The palatine teeth do not extend laterally beyond the centres of the inner nostrils, which are separated more widely than are the outer. The tongue is larger and more fleshy. The dusky marks on the tail are not reticulated, but transverse, and the under side is dusky, not yellow. This very great and marked difference in the form and size of the head of the two specimens, although that with the smaller head is considerably the larger of the two, indicates the distinctness of the species.

Measurements.

	In.	Lin.
Length (along axis) from snout to gape		7.25
" " " gular fold	1	0·
" " " axilla	1	11.25
" " " groin	4	2·5
" " " behind vent	5	3·
" of tail	6	
" from knee to tip of longest toe	1	3·1
Width of head at angle jaw		10·5
" between eyes anteriorly		6·5
" external nares		3·7

Mus. No.	No. of Spec.	Locality.	Donor.
4135	1	Columbus, Ohio.	Leo Lesquereaux.

AMBLYSTOMA TRISRUPTUM Cope.

Spec. nov.

The species is stout and heavy in build; the head very broad, and much depressed. The skin is granulated by contraction of the alcohol, but in respect to glands, pits, etc., appears much like other species. There is, however, a decided feature in certain particles which crowd the parotid region, and are seen also on the top of the head along the inner margin of the orbit, and perhaps below the eye. I have not noticed this character in any other species east of the Rocky Mountains.

The head is broad, ovate, rather pointed anteriorly. The inner and outer nostrils nearly the same distance apart. The tongue is broader than long, more than half the width of the head, filling the interspace of the rami anteriorly.

The teeth are in four very distinct patches, with decided intervals. They form one transverse series, nearly straight centrally (where they are in a line with the posterior border of the internal nares), but curving slightly backwards laterally. The two central patches are wider than the lateral, which vary a little in length, and are separated by an interval half the diameter of the inner nares; their distance from the exterior patches is about twice as great, the centre of the interval falling about opposite to the inner border of inner nares. The outer patches extend about half a diameter beyond the outer border of inner nares.

The remaining external characters of the specimen are not different from those of A. tigrinum.

The colors of the specimen are much obscured by preservation. It appears to have been of a uniform dark blackish or bluish-brown, with a single series of large transversely elliptical blotches of yellow from head to tip of tail, half in body and half in tail, the foremost one rounded, and placed behind the eyes. Those of opposite sides nearly meet on the back, and are confluent on the upper edge of the tail.

This is the only species I have seen of the group in which a strictly transverse series of palatine teeth behind the eye is divided into four groups.

Proportional dimensions.

Spec. 4068. Ocate River, N. M. ♀.

Length of gape of mouth, to its width	little more than half.
Width, to distance from snout to gular fold	not quite equal.
" " groin	4 times.
From snout to gular fold, contained in distance from snout to groin	3½
Distance anteriorly between eyes, in length of orbit	3
" from eyes to nostrils " "	1½
" between external nostrils, " "	not quite 2
" " internal " " "	2
Width of tongue, to width of head	over ½
Free portion of longest finger contained in distance from elbow to tip	little over 3 times.
Free portion of longest toe contained in distance from knee to tip	3½
Distance between outstretched toes in length from snout to groin	about equal.
Length tail from behind anus, to rest of animal	less.

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Measurements.

Length (measured along axis of body) from snout to gape	·45
" " " gular fold	·90
" " " armpit	1·45
" " " groin	3·15
" " " behind anus	3·80
" " " end of tail	6·80
Width of head	·80
" tongue	·45
" orbit	·18
Distance between eyes anteriorly	·50
" " outer nostrils	·22
" " inner "	·30
" " armpit and groin	1·80
Height of tail where highest	·46
Breadth " "	·24
Free portion of longest finger	·26
From elbow to tip of longest finger	·90
Free portion of longest toe	·29
From knee to tip of longest toe	·96
Distance between outstretched toes	3·00

One spec. 4068. ♀ Ocate River, N. M., from John Potts.

AMBLYSTOMA JEFFERSONIANUM Baird.

Jour. Acad. Nat. Sci. i. 283. *Salamandra* Green, Contr. Maclurean Lyceum i. p. 4, 1827; Holbr., N. Amer. Herp. v. 51, pl. 14. *Triton niger* Dekay, Geol. Surv. N. Y. Zool. iii. 85, pl. 15, f. 35. *Salamandra granulata* Dekay, l. c. 1842, 78, pl. 23, f. 66. *Xiphonura jeffersoniana* Tschudi, 1838, Class. Batr. Gray, Catal. Brit. Mus., 1850, 34. *Amblystoma fuscum* Hallow., Journ. A. N. Sci. iii. 355. *Amb. laterale* Hallow., l. c. 352.

Body decidedly more slender and elongate than in *A. punctatum*. Skin everywhere smooth, and showing through the transparent epidermis the ends of the glands, which thickly stud the entire surface. Under a lens are seen numerous small rounded, shallow pits between the glands, not on them. The contraction of the skin, in strong alcohol, between these glands, would readily impart a granulated appearance. The glandules are accumulated into a thin stratum above the parotid groove.

The head is elongated, with the muzzle obtuse or truncate, the greatest width contained one time in the distance to gular fold, and from four and a half to five times to the groin; the distance to the gular fold is contained three and two-thirds times in that to the groin. The eyes are rather large, and situated far behind. They are distant once the length of the orbit from the nostrils (which are separated by nearly twice this length). The anterior extremities of the orbit are distant more than twice this length.

The gular fold or furrow is distinct, not very prominent above; that behind the angle of the jaws is inconspicuous, as is the lateral parotid furrow.

There are twelve costal furrows, including the inguinal and axillary.

The tail is a little shorter than the body and head (measuring from posterior extremity of vent.) It is oval in cross section, largest below, though without any ridge or crest. It is little higher than broad at the anus, but becomes more and more compressed to the tip, the upper and under outlines remaining nearly parallel for a considerable distance. The anal slit is prolonged into a groove, which extends beneath the tail to its very tip.

The tail is curved strongly upwards in the alcoholic specimen, but this is due to the corrugation of the spirit.

The limbs are largely developed, and the toes very long. The digits cylindrical, depressed, without any lateral or basal web. The third finger is long-

est, then the second, fourth and first. It is one-third the length of arm from elbow. The fourth toe is longest, then the third (but little shorter), second, fifth and first; it is contained about two and a half or two times in the length of leg from knee. The expanse of the outstretched toes is very nearly equal to the distance from snout to the groin. The length of the limbs varies a little; when extended on the sides they may scarcely meet, or considerably overlap.

The tongue is thick and fleshy; much as in *A. punctatum*.

The teeth are in four patches; the two central in nearly a straight line, or forming in smaller individuals a very obtuse Λ, the angle anterior, but not passing the posterior border of the internal nares; the sides of the Λ are perhaps slightly concave anteriorly. This patch or line extends to the inner nares, and is there continuous with the lateral patches, which are short, nearly straight, about one-fourth the central patch, and form the posterior border of the inner nares. These are large, far back, and widely separated.

In alcohol, after long immersion, the specimen is nearly uniform light liver-brown, paler beneath, without any spots.

Length from snout to gular fold	·70
" " groin	2·55
" " end of anus	3·20
" remnant of tail	2·50
Width of head	·50
Length of mouth, along median line	·38
" forearm from elbow	·62
" leg from knee	·85

The specimen from which the preceding description has been taken, is, if not the original upon which Dr. Green's species was founded, at least one collected in the same locality and named by him, having formed part of his collection, and presented many years ago by its owner to the Smithsonian Institution. The "light blue spots" so conspicuous in fresh specimens have disappeared.

Dr. Holbrook, in describing this species has mixed with it the account of the tongue and teeth of *Plethodon glutinosus*, which it somewhat resembles, but which may be readily distinguished externally by the lighter silvery spots, and much shorter digits. This induced Dr. Hallowell erroneously to make the species a synonym of *P. glutinosus*. The error had its origin, no doubt, in the nearer resemblence of the var. *laterale* to the latter species.

A confusion of the specimen described with the type of DeKay's *Salamandra granulata*, exhibits no appreciable difference except in the darker color, rather more depressed toes, and perhaps more massive looking jaws of the latter, the muzzle a little more pointed; all uncertain characters in alcoholic specimens. The palatine teeth are in better preservation than in the specimen here described. The central patch is interrupted along the middle line and does not extend quite so far laterally. The legs and digits are much lengthened, the figure and description of Holbrook (see DeKay) conveying a very erroneous impression in this respect. The granulation referred to is in part the optical effect of the glands of the skin, showing through the transparent epidermis; partly the result of contraction of the skin by alcohol.

In the type specimen there are no symmetrically arranged patches of pores on the head. Their absence may be owing to the long continued preservation of the specimens or to some accidental deficiency. In the type of *granulata* these are quite visible. They are very distinctly shown in No. 4688, where there is seen a straight series interior to the eye and nostril (not reaching to the latter), bending abruptly behind the eye and passing beneath it. On the parotid region above the lateral groove is a slightly curved line

of six or eight pores, and a shorter straight one above it. Below the groove is a crowded patch which is continued into a simple series along the inner edge of the lower jaw. One or two are seen at the side of the base of the lower jaw, and others along the sides of body.

It has been stated that in the type no indication of light spots was visible. In others, however, of more recent preservation, these are quite evident. In the smallest specimen of 3998 are visible numerous rounded irregularly disposed light spots on the lower part of the sides, with some scattered over on the belly averaging half the size of the eye, but with faintly defined margins. Some scattered ones are seen on the side of the tail; these may be plumbeous or bluish in life.

In the largest specimen of 3979, Ripley, Ohio, these bluish spots are quite evident on the side of body and tail.

Generally the ground color is, of the alcoholic specimen, olive brown, sometimes blackish, lighter beneath. The color of the living animal is similar to that above described from alcoholic specimens.

The youngest specimen examined is about two inches long and is not materially different from the adult, although the two inner palatine patches appear more arched.

There are two varieties of this species other than the typical, as follows:

Var. fuscum (*Amblystoma fuscum* Hallow.) is dark brown, with an especially dark shade or band along the sides. Type in Mus. Academy from near Hanover Co., W. Indiana. 3697 Mus. Smithsonian, Clarke Co., Va.

Measurements of 3697.

Length from snout to end of mouth	·30
" " gular fold	·55
" " groin	1·90
" " end of anal slit	2·25
" " end of tail	3·80
Width of head	·40
Fore arm from elbow	·50
Leg from knee	·62
Extent of hind leg	1·80

Var. lateral e (*Ambl. laterale* Hallow). The length of the fissure of the eye enter the width between the anterior canthi of the same twice only. The color black with large white spots on the sides and tail, and smaller ones on the belly. Size about half the size of the adult of the typical variety, and the medium series of palatine teeth convex forward. The distribution of this form is northward. Specimens 7011 and 5941 from Milwaukee and high land between River St. Lawrence and Hudson's Bay. In Mus. Academy, from Michigan and from north side Lake Superior.

The dark color of the coagulated blood in the vena lateralis gives rise sometimes to the deceptive appearance of a color stripe.

Cat. No.	No. of Spec.	Locality.	From whom received.
3968	1	Canonsburg, Pa.	Dr. F. Bache.
3979	4	Ripley, Ohio.	Dr. Hoy.
3998	1 is 7145 } 12	Cleveland, Ohio.	Dr. Kirtland.
3989	2	New York,	N. Y. State Cab. (type of *S. granulata*, DeKay.
3997	1	Racine, Wis.	Dr. Hoy.
4689	1	Lake Superior.	Dr. Hoy.
4690	2	St. Catharine, C. W.	D. W. Beadle.
3888	2(larva)	Burlington, Vt.	Z. Thompson.

Also from Philadelphia.

AMBLYSTOMA PLATINEUM, Cope sp. nov.

This is one of the more elongate species and in many respects allied to the *A. jeffersonianum*.

The head is oval and the muzzle rounded. The length of the fissure of the eye equals the distance of the nostril from the same, is but little less than the distance between the nares, and half or a little more of the distance between the anterior canthus of the same. Inner and outer nares the same distance apart. Greatest width of head 5·5 to 6 times in length from end muzzle to groin, five sevenths length from chin to gular fold. Canthus of mouth behind canthus of eye. A series of pores along the superciliary, which pass round the orbit behind and below; a scattered longitudinal series on the parotoid region, and a transverse aggregation of the same on each side below parotoid groove; a single series of the same for a short distance inside the ramus of the mandible. The parotoid region possesses a thin stratum of dermal cryptæ.

Costal folds 12; the anterior is a little distance behind the axilla. Toes subcylindric, similar to that of the A. jeffersonianum; in one specimen (type) they are separated by nearly an intercostal space when the limbs are pressed to the sides; in another they meet. Tail rounded above at base, finally much compressed, but not elevated, equal, in one specimen body and head to middle orbit, measured from posterior extremity vent. In the type, however, it is much shorter, extending from its basis only to the eighth costal fold (from groin), but I am not sure that this is normal.

Color leaden, in type paler below with numerous indistinct whitish blotches. Eye lids yellowish margined. Sp. 4688 has the abdomen darker and without spots.

No.	Locality.	Donor.	No. Sp.
7145	Cleveland, Ohio.	Prof. J. P. Kirtland.	1
4688	Unknown.	Prof. Agassiz.	1

The narrower head and more elongate body will distinguish this species from the A. jeffersonianum. It is readily distinguishable among many individuals, nevertheless many of those of the var. lateralis approach it in the proportions of the parts of the head to each other. These points are the closer approximation of the eyes and of the nostrils. The shorter body is, however, always preserved. The size of the lateralis is considerably less. Those of the typical var. of the same species are invariably stouter, not only in body but head.

AMBLYSTOMA MACRODACTYLUM Baird.

Journ. Ac. N. Sci. Phila. i. p. 292.

This species is the slenderest of all our speces of *Amblystoma*, in this respect as well as length of digits exceeding even the *A. jeffersonianum*.

The specimen before me is too small to furnish any reliable indication as to the character of the glands, and pores of the skin. These are probably much as in *A. jeffersonianum*. No pores are visible on the head arranged in regular patterns.

The head is rather large, depressed and elongated, with a moderate constriction at the neck. The eyes are prominent and distant less than two lengths of the orbit. The outer and inner nostrils are each about one orbit distant. The width of the head is about three-quarters the distance to gular fold.

The tongue is oval and longitudinal. The palatine teeth are in three or four patches, the central largest, occasionally separated by an interval less than half the diameter of the inner nostrils; together they form a line, slightly angular anteriorly, where they reach to about opposite the centre of the inner nostrils; laterally they pass a little the outer margin of the inner nostrils.

The body is cylindrical-depressed, with twelve costal furrows. The tail is broken; but from what is left appears to be somewhat compressed, but much rounded.

The color in alcohol appears to be brown with a well defined broad dorsal stripe of grayish brown, which involving the whole upper surface of the head and neck contracts on the nape, swelling again on the back, with an average breadth of the outer orbital space; this stripe seems to extend to the end of the tail. On each side of this dorsal stripe is a suffusion of dark brown which gradually pales through the color of the sides into the belly; there are also a few spots of the same in the dorsal stripe. There are a few grayish white dots scattered along the sides, and perhaps on the limbs.

Two specimens (4054) from Puget Sound, agree in form with the preceding specimen; the two central patches of palatine teeth perhaps a little more angularly arranged, Instead of the grayish dorsal stripe, however, there is a brownish red one, and the sides are of a darker and more continuous brown. No. 4711 has a similar character of palatines but a coloration more like the type. The palatines in fact extends a little in front of the anterior border of the inner nostrils.

Proportional Dimensions of 4042.

Length of gape of mouth, to its width	two thirds.
Width, to distance from snout to gular fold	about $\frac{3}{4}$.
" " " groin	5 times.
From snout to gular fold, contained in distance from snout to groin	$3\frac{1}{2}$.
Distance anteriorly between eyes, in length of orbit	less than 2.
" between external nostrils	one orbit.
" " internal	"
Free portion of longest finger contained in distance from elbow to tip	about $2\frac{1}{4}$.
Free portion of longest toe contained in distance from kneee to tip	$2\frac{1}{2}$.
Distance between outstretched toes in length from snout to groin	about equal.
Number of costal furrows (including axillary and inguinal)	12.

Measurements.

Length (measured along axis of body) from snout to gape	·20
" " " gular fold	·44
" " " armpit	·65
" " " groin	1·50
" " " behind anus	1·82
" " " end of tail	broken
Width of head	·30
" tongue	·17
Length of orbit	·12
Distance between eyes anteriorly	·20
" " outer nostrils	·12
" " inner nostrils	·12
" " armpit and groin	·90
Height of tail where highest	·18
Free portion of longest finger	·15
From elbow to tip of longest finger	·39
Free portion of longest toe	·20
From knee to tip of longest toe	·50
Distance between outstretched toes	1·40
Total length of a larger specimen	4 in. 4 l.

Cat. No.	No. of Spec.	Locality.	From whom received.
4042	1	Astoria, O.	Acad. Nat. Science.
4711	1	Simiahmoo.	A. Campbell.
4054	2	Puget Sound.	Dr. Suckley.
4035	2 (larva)	Wash. Terr.. (Aug. 1.)	Dr. Cooper.
5982	14	Chiloweyuck Lake, Or'g	Dr. C. B. Kennerly.
5248	1	Walla Walla, Ft. Benton.	Lt. Mullen.

AMBLYSTOMA PAROTICUM Baird.

Spec. nov.

This Salamander is of very peculiar character. It is one of the stout-bodied species, in this respect about equal to *A. punctatum*, but with a broader head.

In the type specimen (4708) the skin is remarkably free from pits, pores and milk glands. These are found on the parotid region, both above and below the horizontal furrow from eye to side of neck, which is swollen in consequence. There is also a small patch on top of head, bordering the orbit; a patch on the spaces between the intercostal furrows, on the upper part of the sides, extending, though faintly, nearly to the belly. Along the ridge of the tail, bordered below by an indented line, the glands are thickly crowded. A few scattered glands are seen along the back. Elsewhere the skin is perfectly smooth and glandless, with the muscle directly beneath it, although probably when fresh the usual shallow pits of the group stud the skin thickly everywhere, as usual. These are distinctly visible in a second specimen, 4709. In this, also, the glands are more numerous on the back, and extend farther down the side of the tail.

The head is broad and depressed; considerably constricted at the neck. The eyes are unusually large and prominent for the genus; separated anteriorly by about twice the length of their orbits; distant from the nostrils less than this length. The outer and inner nostrils are respectively about equidistant by little more than one length of the orbit.

The tongue is moderate, nearly orbicular, filling the rami only anteriorly, and hardly more than half the width of the head.

The teeth are in four patches, forming a transverse series, slightly angular anteriorly, where they extend to about opposite the centres of the inner nostrils. The two central patches are rather the larger, with a slight interval. They extend postero-laterally nearly to the inner margin of inner nostrils; these are separated from the outer patches by an interval nearly the width of the inner nostrils. The lateral patches extend a short distance beyond the outer margin of the inner nostrils. The sphenoidal portion of the roof of the mouth is much restricted laterally and behind.

The body is full, rounded and depressed; there are eleven costal furrows, including inguinal and axillary.

The tail is compressed, but oval in cross section, with the lower edge rather sharp towards the end; the upper outline is much rounded. It is not high, and not as long as the rest of head and body; longer than from snout to groin. In one specimen there is a distinct furrow along the under side.

The limbs are large; the digits lengthened, more depressed than in *A. punctatum*, but linear, not triangular in shape. The lateral ones are more lengthened than usual, and those of each limb are more nearly of a length. The free portion of longest finger is more than one-third from tip to elbow; that of longest toe in the same proportion.

The gape of the head is wide; the length more than half the width. The width of the head is contained four times in distance from snout to groin.

The color in one specimen is everywhere a dull reddish olive or brown, paler beneath, and without the trace of any spots. No. 4707 is much darker —nearly black.

The Amblystoma t r i s r u p t u m Cope, from Ocate Creek, is similar to the

resent species in the intervals between the *four* palatine patches and the lands on the parotid region. The rest of the skin, however, as far as can be scertained, is glandular, as in *A. punctatum*, *tigrinum*, etc. The digits, too, re shorter, flatter, more irregular, the lateral and central more unequal; the yes are much smaller and farther apart; there are 12 costal furrows, not 11, tc.

Proportional Dimensions.

ength of gape of mouth, to its width	more than half.
Vidth, to distance from snout to gular fold	cont. $1\frac{1}{4}$
groin	$4\frac{1}{2}$
behind anus	$+5$
rom snout to gular fold, contained in distance from snout to groin	$3\frac{1}{2}$
behind anus	$+4$
istance anteriorly between eyes, in length of orbit	2
from eyes to nostrils	little over 1.
between external nostrils	" 1.
internal nostrils	about 1.
Vidth of tongue to width of head	little over half.
ree portion of longest finger contained in distance from elbow to tip	$2\frac{2}{3}$
istance between outstretched toes in length from snout to groin	equal.

Measurements.

ength (measured along axis of body) from snout to gape	.50
gular fold	.95
armpit	1.50
groin	3·10
behind anus	3·80
end of tail	7·20
Vidth of head	·75
tongue	·40
ength of orbit	·25
istance between eyes anteriorly	·45
outer nostrils	·25
inner nostrils	·24
eight of tail where highest	·45
readth " "	·20
ree portion of longest finger	·30
rom elbow to tip of longest finger	·83
ree portion of longest toe	·35
rom knee to tip of longest toe	1·00
istance between outstretched toes	3·05

at. No.	No. of Spec.	Locality.	From whom received.
708	1 ♀	Chiloweyuck, W. T. (1859)	A. Campbell (type).
708	2	Near Simiahmoo.	"
634	1	Coal mines of Vancouver Isl.	Alden W. Hewson.
021	1	Puget's Sound.	Dr. Kennerly.

AMBLYSTOMA ATERRIMUM Cope.

p. nov.

This is a stout species, having a form of head intermediate between that of he A. tenebrosum and A. mavortium. The dentition is quite pecuiar, and with the ensemble of its characters, refers it to the immediate neighorhood of the A. tenebrosum.

Head a broad oval; its greatest width a little over $\frac{1}{4}$ the length from end nuzzle to gular fold, and 4·2 in same to groin. The pupil marks three-sev-

enths the distance from canthus of mouth to external nostril. Fissure orbit equal length from same to nostril, and enters 1·66 times width between the latter; it is contained 2·25 times in width between anterior canthi of eyes. Canthus rostralis marked at orbit, terminating very obtusely at nostril; the profile descends steeply from line of latter, not being prolonged as in A. tenebrosum Thus from the line connecting middle of inner nares to lip is ·75 external internarial distance, and ·6 between anterior canthus of eyes; in A. tenebrosum, same equals internarial width, and ·75 the distance between eyes. The distances between inner and outer nares are the same; the former are round. The series of palatine teeth commence only opposite the middle of the posterior margin of the internal nares, and describe a slight curve round their inner margins to a point just in advance of their anterior, then turn abruptly inwards and slightly backwards, making a right angle with their previous course; they converge but do not unite.

Tongue large, as broad as long. Gular fold well marked; parotid groove not visible, perhaps accidentally. It is difficult, as in the A. tenebrosum, to distinguish the costal folds; there are not more than 12.

The tail is short and stout; its upper edge is much compressed, as is the posterior half; its glandular structures are much less developed than in other species of Amblystoma, the crypts of the crest being minute and globular. Length of tail equal from its origin (posterior margin vent) to posterior outline of sternum.

The extremities are very stout, just meeting when laid along the side. The palms and soles are very wide, and the toes short and flattened; they stand, as regards length, behind 3—4—2—5—1; before 3—2—4—1.

The color is black above, lead-colored below.

	In.	Lin.
Length from snout to gape (flat proj.)		7·1
gular fold		12·75
axilla		19·1
groin		39·
end of vent		48·
end tail	6	6.
Width of head		9·75
tongue		5·2
between eyes anteriorly		5.
nostrils		4.
inner nostrils		3.
from eye to nostril		2·25
Circumference belly		23·6
Greatest height tail		5.4
width "		4·5
Free portion longest finger		2·5
From elbow to tip of do		9·75
Free part longest toe		3·
Knee to tip of do		11·
Extent of outstretched toes	3	3·1

No. 5242. From North Rocky Mountains. Lieut. Mullen.

AMBLYSTOMA TENEBROSUM Baird and Girard.

Pr. A. N. S. Phila. 1852, 174. U. S. Exp. Ex. Rept. p. 14, Tab.

This species forms the type of a special section of the genus, differing as it does from all other *Amblystomata* of North America. It is especially characterized by its massive frame and huge size among true Salamanders, as well as by other peculiarities hereafter to be mentioned.

The corrugation of the skin prevents any critical examination of its character in respect to glands, pits, etc. It is certainly less glandular than in *A.*

punctatum or *luridum*, although scattered glands may be detected closely and evenly distributed on the whole back and sides and on the chin: the remaining under parts and snout before the eyes are smooth.

The head is very massively built; large; broadest behind the eyes and triangular; the sides being nearly straight to the narrow and rounded tip. The eyes are very large and prominent, separated by less than two lengths of the orbit, and distant less than one length from the outer nostrils, which are separated by 1¼ orbits distance, and placed on the side below the distinct canthus rostralis. The outer nostrils are much more distant than the inner, which are very large, much excavated and have the external canal occupied by a soft plaited membrane.

The tongue is thick and fleshy, nearly orbicular; but angular anteriorly. It fills up the lower jaw pretty well, and is more than half the width of the head.

The palatine teeth are in two patches only; each very slightly convex anteriorly, coming together at a slight angle with the apex backward, but separated along the median line. Laterally the patches of teeth form the posterior margin of the inner nares, and do not extend beyond their outer margin. The entire series is thus posterior to the nostrils. In younger specimens the series are more transverse, the inner extremities slightly incurved.

The width of the head is contained 1⅓ times in distance to gular fold, and 4 times to groin.

The body is rounded and depressed. There are 12 costal furrows.

The tail in the two specimens before me is considerably less than half the total length. It is much compressed from near the base, and the edges near the end are quite sharp. It is far short of being as deep at the base as the body.

The limbs are stout; the digits, the fingers especially, are short, considerably depressed, but linear and blunt at the tip; the under surfaces of these are somewhat swollen into a kind of bulb, which in alcohol contracts into something the appearance of a disk. The third finger is longest, but is very little more than the 2d, and this than the 1st and 4th. The third finger is contained nearly 4 times in the distance from elbow to tip. The 4th toe is longer than 3d in three specimens, in one the 3d exceeds the 4th a little, and the same are nearly equal in case of the fingers.

The color of this species in alcohol is a kind of dark reddish-brown, pale beneath, mottled and marbled above and on the sides with darker brownish; most distinct on the head, especially on the snout, where the skin is perfectly smooth. The head shows a tinge of greyish in the ground color.

(For fresh color see the figure in Girard's Herpetology of the United States Exploring Expedition.)

There are two varieties of this species:

a. Where the loreal region is flat and the muzzle narrower before the orbits, and the marblings confined to the head; the body being of a nearly uniform brown; represented by specimens 4710 and 4053.

β. The loreal region swollen in front of orbits, and hence the muzzle broader; the ground color greyish, with coarse brown marbling, like large hollow spots, distributed over the whole upper surfaces of the body and tail. Represented by No. 5981, and a large specimen (length 8 in. 6 lin.) in Mus. Academy Nat. Sciences, from Body Bay, lat. 38° 18′ N., on the coast of California, procured by our esteemed correspondent, George Davidson.

Proportional Dimensions.

Length of gape of mouth, to its width	⅔
Width contained in distance from snout to gular fold	1¼
groin	4
From snout to gular fold, contained in distance from snout to groin	little over 3 times.

Distance anteriorly between eyes, in length of orbit	not quite twice.
from eyes to nostrils	four-fifths.
between external nostrils	$1\frac{1}{4}$
internal	four-fifths.
Width of tongue, to width of head	$\frac{1}{2}$
Free portion of longest finger contained in distance from elbow to tip	nearly 4 times.
Free portion of longest toe contained in distance from knee to tip	" $3\frac{1}{2}$ "
Distance between outstretched toes in length from snout to groin	$1\frac{1}{4}$
Length of tail from behind anus, to rest of animal	contained $1\frac{1}{2}$ "
total length	two-fifths.

Measurements.

Length (measured along axis of body) from snout to gape	·80
gular fold	1·50
armpit	2·10
groin	4·55
behind anus	5·65
end of tail	9·30
Width of head	1·15
tongue	·60
Length of orbit	·34
Distance between eyes anteriorly	·58
outer nostrils	·40
inner nostrils	·30
from eye to "	·26
Circumference of belly	4·00
Distance between armpit and groin	2·65
Height of tail where highest	·65
Breadth do.	·36
Free portion of longest finger	·26
From elbow to tip of longest finger	1·05
Free portion of longest toe	·36
From knee to tip of longest toe	1·35
Distance between outstretched toes	3·60

Cat. No.	No. of Spec.	Locality.	From whom received.
4710	1	Oregon.	Ex. ex. (type).
4053 (34)	1	Mo. of Columbia.	Lt. Trowbridge (spec. desc. above).
5981	1	Chiloweyuck Lake.	Dr. C. B. Kennerly.

AMBLYSTOMA TEXANUM Baird.

U. S. Mex. Bound. Survey, ii. Reptiles 27 Tab., XXXV. 15. *Salamandra texana* Matthes, Allg. Deutsche Nat. Zeitung i. 266, 1855.

The description of this species is taken from specimens which are not fully grown; the proportions are, however, much those of the *A. microstomum* at the same age: this with the large number of costal grooves renders it almost certain that the full grown individuals are much like those of the latter species, and very probably of near the same size.

Skin everywhere quite smooth, no trace of pores on the head or parotoid region in many specimens. Costal folds fourteen, distinct; head folds slightly marked, the gular slight. A median dorsal groove.

Head oval, rather flattened and broad, canthus rostralis somewhat marked. Mouth large, canthus behind eye, anterior canthus of latter marking middle of margin. Nostril a little nearer eye fissure than length of latter, probably equal in older specimens. Width between anterior canthus of eye double

length of fissure; external separated by one length of same, which is less than the distance between inner nares.

Tongue small as in other young, but not fissured or grooved as in those of the two following Amblystomæ. Palatine teeth forming an arched series between nares extending to their anterior border, and not beyond their inner border in the lateral direction. From their resemblance to those of *A. microstomum* of the same age I suspect they are similar in old individuals.

Body rather slender; width of head at jaws four times in total length to groin and ·75 length to gular fold. Tail short, longer when older, equal from its basis to axilla. Limbs moderately stout, digits elongate, third and fourth toes nearly equal, then 5th, 2nd, 1st. Fingers 3, 2, 4, 1.

Above light brown, with a series of light spots along upper part of sides; these are small and one between each pair costal fold. Sides and belly yellow.

	In.	Lin.
Length end muzzle to canthus oris		2·6
to axilla		6·5
to groin		14.
to end tail	2	3.75
elbow to end finger		3·1
knee to end toe		3·7

Mus. No.	No. Specimens.	Locality.	Collector.
4044	11	San Antonio, Texas.	J. D. Graham.

The plane front and canthus rostralis of this species form a resemblance to the *A. tenebrosum*, between which and *A. microstomum* it is naturally placed.

AMBLYSTOMA CINGULATUM Cope, sp. nov.

This species approaches the *A. microstomum* in general, but may be readily known by its more elongate ovoid head, with long muzzle, more slender form of body and peculiar coloration.

Mucous crypts and pores are not much developed in this animal, a few only of the latter extend along the superciliary region. The costal folds are visible across the abdomen.

The head is elongate, convex both transversely and longitudinally; the upper face of the muzzle is narrowed, and projects beyond the mandible. The width at the jaws enters the length to the groin six and a half times, and one and three-fourths to the edge of the gular fold. The external nares are quite close together, nearer than the long diameter of the eye, and nearly 1·5 this diameter in advance of the eye. The anterior angles of the latter are 2·33 diameters apart. The folds on the side of the head and neck are as in other species. The distance between the inner nares is 1·66 times the distance between the external.

The tongue is oval, quite elongate, but not filling the space between the rami of the mandible; its median groove strongly marked. The palatine teeth are in a single row slightly convex forwards, entirely between the inner nares, their posterior margins of the ends of the series and nares corresponding. The gape of the mouth is short, but longer than in *A. microstomum*; its external canthus falls anterior to the posterior canthus of the eye, while the anterior canthus of the same measures the posterior third of the gape, commencing at the middle of the premaxillary region.

Costal grooves fourteen; a median dorsal groove strongly marked. An unusually strong fold across between angles of mandible, which sends a branch to the orbit; gular fold continued on neck, sending a parotoid groove forwards. Length to gular fold 3·75 in length to groin.

Length of tail nearly equal from basis of same to the mental cross fold. It is of rather uniform depth, much compressed, keeled above and for its distal half below. General form of the body slender and compressed, elevated at the scapular and pelvic regions.

Limbs stout, the fingers slender but not very elongate. Appressed to the sides they fail of meeting by the length of the sole and longest toe; length from tip to tip when outstretched ·66 length to groin. Length of lower leg and foot scarcely ·8 from muzzle to gular fold. No visible plantar tubercles. Fourth toe distinctly longer than third, then 2, 4, 1. Fingers 3, 2, 4, 1.

Color in alcohol black, the under surfaces thickly speckled with grey. A vertical narrow grey line passes between every pair of costal folds and meets its fellow on the dorsal line or bifurcates to meet a similar bifurcation in like manner, embracing an area. These narrow annuli extned nearly as far forwards as the orbits and surround the tail to its extremity. Muzzle black.

	In.	Lin.
Total length	3	6.
Length to canthus oris (straight)		2.25
gular fold		6.
groin		18.7
Width of head		3.2
above femora		2.25

The shades of coloration in this creature are those of the A. opacum, but are differently arranged.

No. 3786; 1 spec. Grahamville, S. Ca. Bailey.

AMBLYSTOMA MICROSTOMUM, Cope.

Proc. Ac. Nat. Sci. Phila., 1861, p. 123. "*Salamandra porphyritica* Green," Hallowell (not of Green), hinc *Amblystoma porphyriticum* Hallowell. Proc. A. N. Sci. 1856, p. 8.

This species is among the most slender of American *Amblystomata*, and has other peculiarities by which it is readily recognizable. The skin is very smooth and slippery, with the glands less evident in the skin than in *A. opacum jeffersonianum*, etc. The skin is everywhere covered with small shallow pits only visible when the mucus is removed, which shows the tail to be sometimes conspicuously granulated, the granules probably corresponding to the ends of the glands. There are no evident pores or pits of larger size than the others on the head and parotids as in some Amblystomata.

The head is very small, narrower than the body, with little or no construction at the neck. It is contained about six and a half to seven times in the distance to the groin. The head is much arched in every direction; the eyes far forward and lateral. The lower jaw projects a little beyond the border of the upper, concealing the latter when viewed from above. The eyes are distant, less than the length of the orbit from the nostrils; their anterior extremities separated by one and a half times this unit. The nostrils are one orbit length apart. The anterior edge of the orbit falls opposite the middle of the gape, instead of in its posterior third, as in *A. jeffersonianum*. The gular fold is distant from the snout one-fifth the distance to the groin.

The body is slender for the genus. There are fourteen costal furrows, including the inguinal and axillary. There is a slight indication of a dorsal groove posteriorly.

The tail is about two-thirds the head and body. It is nearly cylindrical at base; then becoming slightly compressed, more and more so to the tip, where it is quite flat, but without crest, although the edges are sharp. Viewed from the sides, there is a constriction at the base of the tail; this is one-fourth higher in the middle than at the base.

The limbs are weak, the digits are, however, rather long, cylindrical depressed, without membrane. The proportions of the digits as in *A. punctatum*. The longest finger is not one-third the fore arm; the longest toe is a little more than one-third the leg from knee. The outstretched hind legs are about two-thirds the head and body to groin.

The tongue is thick, fleshy and attached, although slightly free at sides and

There is a longitudinal groove in the tongue, separating the two papil-
portions of an oval shape placed side by side. This has not been observed
ffersonianum. The pappillæ form parallel series on each oval oblique to
entral groove with the edge of the tongue projecting beyond them.
ere are only two patches or lines of palatine teeth. These occupy the
le of the palate, forming a Λ, the angle anterior and reaching as far
ard as the anterior border of the inner nares; the postero-external ends
t pass the inner margin of these nares (in the soft palate, the propor-
being a little different in the skull.)
metimes these two patches form nearly a straight line; or at least the
al portion is straight, the lateral bending slightly backwards.
e color in alcohol is a dark brownish black, a very little paler beneath,
thickly and irregularly sprinkled on the sides with plumbeous spots
t the size of the eye of no definite outline. These are less numerous
e and below. Sometimes nearly wanting—sometimes they are larger
as described and look not unlike patches of a grayish lichen growing on
ides.

(1.) Length (along axis of body) from snout to angle of mouth....	·20
gular fold.....	·45
groin.....	2·20
behind anus.....	2·50
tip of tail.....	4·00
of tail.....	1·50
h of head.....	·31
arm from elbow.....	·40
from knee.....	·46
nse of hind legs.....	1·45

e total length of largest specimen seen (3999 St. Louis) is six inches, of
h the tail forms 2·60. The smallest adult is two inches long.
the just perfected young is seen a series of larger illy-defined light spots
elsewhere along each side of the back. The belly is quite light colored.
is species bears a close resemblance to *Plethodon glutinosus*, for which the
ic peculiarities, the longer digits, etc., readily distinguish it. The
h spots too are much less sharply defined and duller, less silvery, and do
ccur on the back, as in *glutinosus*, to anything like the same extent.
A. jeffersonianum it will be known by the projecting lower jaw; much
ler and more arched head, greater number of costal furrows, more
nt spots on the sides, etc., besides the important peculiarities of
ıe and teeth.
is is one of the species whose metamorphosis is completed some time be-
t attains full size. A specimen in which minute stumps of the branchiæ
in measures 2 in. in length; another, without traces of them, 2·15 in.
width of the head enters the length to the groin 4·2 times, and the tail
short of the axilla from its base. These measurements may be compared
those of the adult, in illustration of the general principle that the relative
hs of body and tail increase with increased size.

lo.	No. of Spec.	Locality.	From whom received.
	30	South Illinois.	R. Kennicott (spec. descr.)
	4	New Madrid, Mo.	"
	2	Lancaster, Ohio.	L. Lesquereaux.
	3 (2 larv.)	Columbus, "	"
	2	St. Louis.	Dr. Engelman.
	1	Fort Smith, Ark.	Dr. G. C. Shumard.
	5	Prairie Mer-Rouge, La.	J. Fairie.
	2	Grand Coteau, La.	St. Charles College.
	6 (juv.)	New Madrid, Mo.	R. Kennicott.

[.]

In concluding the review of this genus I wish to criticise the following remarks, published by F. P. Pascoe in Proc. Zool. Soc. London, 1866, p. 223:

"With many naturalists I believe the idea still remains that every genus must have certain definite structural peculiarities, and they appear to expect that broadly dividing lines shall run between them. Any confession that no absolute or primary characters exist, or that they are only secondary, is taken by them as a fatal proof of the weakness of the position. It is true that, owing to the more or less exceptional isolation of many genera, a very clear and decisive description may be given of them; but then it can never be said how soon the discovery of another form or species may upset the characters we have drawn from our limited number of examples, or whether the new genus or species may not be other sex of some other species. Moreover there are many natural assemblages of species, whether we choose to call them genera or not, for which no technical characters can be found, their connection depending partly on peculiarities which it is scarcely possible to convey an adequate idea of in words, partly on such gradual modifications of characters that no satisfactory line can be drawn between them, but which are, notwithstanding, not less real or striking. Those who only select a few prominent forms for description may demur to this; but any one who has gone conscientiously through a large collection will acknowledge how difficult it is in many instances to say if genera really exist, even as a collective term for any limitable number of species, and how unsatisfactory is any attempt to combine species into genera, or individuals into species, or to distinguish hybrids from what we conventionally call true species. It will therefore be readily understood that many genera can only be vaguely defined, either from the absence of salient characters, or from their gradual modifications; and some of the most natural groups among the Coleoptera might be cited as examples of these classes. To argue that genera ought to be ignored, when not strictly defined, would, in entomology, be to make classification impossible; to say that recognized genera should be enlarged from time to time to admit aberrant forms would be merely to create repertories of incongruous species."

When we read "that genera can only be vaguely defined, from the absence of salient characters or their gradual modification," it is evident that there is a contradiction in terms, or that a new definition of a genus has been adopted. Are scientific men prepared to accept the above definition of a genus? We suspect not, for with it the translation of the natural system becomes merely empiric, and that exactitude which characterizes nature vanishes from its written counterpart. A genus, in our estimation, is a series of species distinguished from all other species by one or more structural characteristics, which are not variable in the reproducing adults of that series, or of any other series of species, *not otherwise distinguished*. A genus so defined constitutes one, or most frequently several series of species, bearing a successional relation to each other, which may differ widely in general appearance, coloration, etc., and which are frequently mistaken by zoologists for genera. They are "the assemblages of species, which are not less real or striking," to which our author alludes. I would correct the allusion by calling them assemblages of species which *are* less *real*, though *not* less *striking*.

An error of this kind, or else a want of exhaustive investigation of structure, most probably a combination of both, has no doubt led to the opinions I have quoted above. A rigid classification of characters into essential and non-essential, is what our science everywhere needs. But taking the opposite course, written zoology becomes a panorama rather than an analysis. Were the principles of classification employed by some authors to be applied to domesticated animals, its errors would be obvious to every one.

The genus occupying the preceding pages is an illustration in point. Had the author adopted the various supposed species and genera described

which it includes, he might have readily been brought to the necessity of according with the views above quoted. But a correspondence with nature has required the recognition of *protean* species, as in a higher grade of characters we are compelled to recognize protean genera. These groups are, perhaps, those in which, respectively, certain characters are, for the time being, undergoing a transition, which transition may at some period cease.

The serial relation of species has been above alluded to. This is far less obvious, however, than the serial relation of genera. This does not, however, interfere with the entire isolation of the latter from each other as regards any single geologic period, considered by itself. The naming of groups of species which do not present this isolation, though prevalent in some branches of zoology, is, in our estimation, a violation of the meaning of the name genus, and very disadvantageous to science. It is, of course, of no consequence to science whether a genus contains one or a thousand species, and for the student they can be as well classified and characterized in the latter case as the former. In the multiplication of names a new burthen is imposed—but what shall we say when these co ue to apply to something "vaguely defined," or "for which no technical description ca. be found"!*

II. *Species of* AMBLYSTOMA *unknown to the writer.*

Amblystoma punctulatum Gray, Catal. Batrachia Gradientia, Brit. Museum, 37, 1850.

Said to be from Monterey, California. The description is too brief to enable us to recognize or place it.

III. *Descriptions of two new Pacific species of* PLETHODON Tsch.

PLETHODON INTERMEDIUS Baird.

This new species, in general appearance, proportions of body, etc., is very similar to *P. erythronotus*, although abundant differences are easily discoverable. The body, as in *erythronotus*, is slender and depressed; the tail, as far as indicated by the portion still remaining, is slightly compressed.

There are no apparent peculiarities about the head. The tongue is elongated, elliptical, without posterior emargination. There ar 14 costal furrows, or perhaps 15, if we include one above the axilla. The distance from snout to axilla is contained rather less than three times in that to groin.

The digits are well developed; more as in *P. glutinosus*. There is little if any indication of web at their bases; the three terminal phalanges of the 3d and 4th toes being free. The 2d and 4th toes are about equal. The outer toe is not more than half the 2d; the 1st finger and toe are almost rudimentary. The 3d finger is decidedly longer than the 2d.

The dorsal surface of this species is traversed by a broad brownish-red stripe, extending from the nape to the end of the tail, the sides regular and nearly parallel, though more separated towards the middle of the back, where it is as wide as the interorbital space. The stripe is sparsely dotted with dusky throughout its extent. The sides are abruptly blackish-brown on each

* Another example of this mode of procedure may be found in a classification of the Crocodilia, by Dr. Gray, in the Trans. Zool. Society, London, 1867, which only needs to be read to explain the applicability of the above remarks. The absence of all contrast in many of the generic tables is because they do not exist as such in nature.

It may be added in this connection that the writer omits dates of publication of the names of the genus Osteolæmus Cope, the latter having over a year priority over *Halcrosia* Gray, the name adopted. He calls the species *H. nigra* from the *Crocodilus niger* of Latreille, H. N. Rept. page 210 (not 510, as given by Gray), a species based on the MS. notes of Adanson, with the only description that it is black, and that its jaws are longer than those of the Crocodilus of the Nile. Should such a description be sufficient to establish a species, which we greatly doubt, it is enough to indicate its inapplicability to this present one, that the jaws of the Osteolæmus tetraspes are always much shorter than those of the Crocodilus vulgaris, a fact readily determined by reference to Dr. Gray's essay itself.

side the dorsal stripe, at first continuous, but becoming more and more interrupted by mottling. The belly is light brownish-yellow, thickly mottled with dark brown in about equal proportions; tightest under the chin. There is a dusky line from the eye to the point of the muzzle.

The general proportions and structure of this species are more those of *P. glutinosus* than of *erythronotus*, although slenderer of body. In both there are about 14 costal grooves. The outer digit in *intermedius* is nearly rudimentary instead of prominent, as in the other species.

A distinguishing feature, when compared with *cinereus* and *erythronotus*, is found in the 14 instead of 18 costal grooves, the fore and hind limbs being thus less widely separated proportionally. The legs are slender and the digits much less webbed (scarcely at all, in fact). The 3d and 4th toes, especially, are much longer.

Independent of the structural peculiarities I find nothing in the color to distinguish this species from *erythronotus*.

Measurements.

Length (measured along axis of body) from snout to gape	·14
" " " gular fold	·45
" " " armpit	·65
" " " groin	1·80
" " " behind anus	2·15
" " " end of tail	3·65
tail	1·50
Width of head	·25
tongue	·15
Length of tongue	·24
orbit	.09
Distance between eyes anteriorly	·15
Circumference of belly	.80
Distance between armpit and groin	1.25
Height of tail where highest	·17
Breadth do.	·16
Free portion of longest finger	·07
From elbow to tip of longest finger	·31
Free portion of longest toe	·11
From knee to tip of longest toe	·37
Distance between outstretched toes	1·10

Cat. No.	No. of Spec.	Locality.	From whom received.
4732	1	Fort Tejon, Cal.	J. Xantus (type of descr.)
6635	1	Coal mines, Vancouver Isl.	Alden W. Hewson.

PLETHODON CROCEATER Cope.

The largest species of the genus, and one of the most ornamented of the American salamanders.

In primary features this species is near the P. ensatus (*Heredia oregonensis* Girard,) having the attachment of the tongue along the median line, quite narrow, and a very narrow free margin in front. The palatine teeth form two long transverse separated arcs, which are directed more posteriorly at their median than exterior extremity, the latter extending further outside the outer margin of the inner nares than the transverse diameter of the same. The tail is subcylindrical and slender, compressed and narrowed in section below. No prominent glandular agglomerations or pores. Only three phalanges in the fourth toe.

Form of head peculiar; it is very broad, with straight converging maxillary outlines and truncate muzzle. Upper surface much narrowed on muzzle, loreal regions plane, very oblique, canthus rostralis not marked. Maxillary outline obliquely spread at and behinds orbits, where it is exceeded by the

projecting margin of the mandible. Anteriorly, with the end of the muzzle it projects considerably beyond mandible. Muzzle truncate in profile, a slight emargination at middle of premaxillary border, and a groove on each side of it on inferior projecting face of lip. Nares terminal some distance above the angulation of the lip, continued below in a groove which bifurcates near lip margin; the posterior line extending a short distance, the anterior to the median emargination separating the anterior from the inferior plane of the muzzle. Eye large, not very prominent, its anterior canthus well in front of middle of jaw, and separated one diameter from nostril, and 1·5 from the other eye.

No fold across from angle to angle of mandible, but the gular, parotoid and postorbital grooves well marked. Costal grooves indistinct, thirteen. Skin everywhere very smooth.

Tail longer than head and body by the length of the mouth. Width at curve of mandible 4·6 times in length to groin. Extremities slender and long; when pressed to the sides the fingers extend to the heel. Length of whole fore limb 2·75 times in length to groin. Inner finger very small, half the length of the fourth; third longer than second. Sole narrow, longer than the longest toes. Inner toe less than one half the fifth; third a trifle longer than fourth; second much longer than fifth. Lower leg ·75 thigh to groin.

Patches of parasphenoidal teeth two, in contact anteriorly, well separated from palatine. All the teeth minute, numerous, acute cylindro-conic. Tongue with rather straight lateral and posterior outlines.

Color throughout pitchy black, fading into bright red orange below; limbs orange, a blackish cross band below the knee. A large red orange spot on each parotoid region, and four smaller irregular similar spots on the body to base of tail, on each side of and near the vertebral line. A pair of orange spots at base of tail, and a distant series on the upper face of the tail.

Measurements.

	In.	Lin.
Length (measured along axis of body)	5	·11
" From sonut to gape, (on front)		·5
" " gular fold		·8
" " armpit	1	0·75
" " groin	2	5.
" " centre of anal slit		4.5
Width of head		6·75
tongue		3·75
Length of orbit		2.2
Distance between eyes anteriorly		3·3
outer nostrils		2·3
inner nostrils		2.
Heighth of tail where highest		3·
Breadth " " "		2·5
Free portion of longest finger		2.25
From elbow to tip of longest finger		7·25
Free portion of longest toe		2·75
From knee to tip of longest toe		8·5
Distance between outstretched toes	2	4·4

One specimen. Fort Tejon, Cal. J. Xantus.

The only genus omitted from my examination of the families of Urodela* is Aneides Baird. An examination of the skeleton shows that genus enters the Plethodontidæ and is nearest Plethodon, but differs from it in having the mandibular teeth confined to the distal half, and exceedingly long and compressed, thus differing from all known Urodela.

* Journ. A. N. S. 1866.

FASTI ORNITHOLOGIÆ.

BY JOHN CASSIN.

Vain is it that your science sweeps the skies,
Each, after all, learns only what he can!
—*Faust, Brooks' translation.*

No. 3.

ENCYCLOPÆDIA LONDINENSIS, OR UNIVERSAL DICTIONARY, &c., &c.

Compiled, digested and arranged by John Wilkes, of Midland House, in the County of Sussex, Esquire; assisted by eminent scholars of the English, Scotch and Irish Universities. London, 1795 to 1829. 24 vols. quarto, many plates of Natural History.

The Natural History contained in this Encyclopædia is the basis of a work published separately, and apparently nearly simultaneously, much enlarged and popularized, and forming fourteen volumes octavo, with the following title:

"A genuine and universal System of Natural History, comprising the three Kingdoms of Animals, Vegetables and Minerals, arranged under their respective Classes, Orders, Genera and Species, by the late Sir Charles Linnæus, Professor of Physic and Botany in the University of Upsal, and President of the Royal Academy of Stockholm; improved, corrected and enlarged by J. Frid. Gmelin, M. D., Professor of Natural History in the Royal Society of Gottingen;

"Faithfully translated, and rendered more complete by the addition of Vaillant's beautiful Birds of Africa; the superb Fish of Mark Eleazer Bloch; the Amphibious Animals, Reptiles, Insects, &c., in the costly works of Albertus Seba, Merian, Fabricius, Knorr, &c.; the elegant improvements of the Comte de Buffon, and the more modern discoveries of the British Navigators in the South Pacific Ocean, New Holland, &c., &c.

"Methodically incorporated and arranged by the Editors of the Encyclopædia Londinensis." London, 14 vols. octavo, dated only on the plates. In these fourteen volumes there are 415 plates, colored, 162 of which represent birds. The greater part are in octavo form, and evidently engraved expressly for this work; the remainder are from the Encyclopædia, mainly (in birds) representing Le Vaillant's species, and are quarto, folded.

The Encyclopædia Londinensis contains nearly or quite the whole of Gmelin's edition of the Systema Naturæ, but perhaps rather more completely the zoological portion thereof, and in some genera of birds rather strictly according to the version of Turton. There are additions by the editor or editors, the most important of which, in ornithology, are the species given in the various works of Le Vaillant, a large number of which are named for the first time by any English naturalist or writer, and in some instances having the precedence over all others quite entirely. Daudin, Vieillot, Shaw and Latham are the principal competitors, and successfully so, in the large majority of species, but by very small figures; and with Vieillot there is a *tie* of date occasionally, as, for example, in the genera *Muscicapa* and *Motacilla*. The dates of publication (in the Encyclopædia) are easily determined, being engraved on every plate.

The names and the descriptions of birds in this Encyclopædia I have never seen quoted nor otherwise alluded to, by any author; an omission or oversight, as it seems to me, without sufficient reason, granting the doubtful presumption (though odd accident in this wide-awake age) that any writing naturalist or amateur ever saw them (except myself). There is no reason, I think, why the Encyclopædia Londinensis should not be regarded as quite equal in authority to the Nouveau Dictionnaire or the Encyclopedie Methodique, nor any possible impeachment of its respectability and grade of importance as a scientific work.

Who the editors were, in charge of the department of Ornithology, is more than I know; but perhaps some of the more intelligent of the English ornithologists can find out, if they think it worth while. An inquiry in "Notes and Queries" would bring it. John Wilkes, of the County of Sussex, Esquire, is printed on every title-page as the responsible editor throughout, and for the present, as he was presumably an entirely respectable person, I take him at his word, and hold him accordingly,—preferring, however, that it be distinctly understood and remembered that there was another of the same name (who did not concern himself with Encyclopæliæ, so far as I ever heard, but was in a much less creditable business). In a preface to Vol. I of the octavo work it is stated that "This comprehensive system of Natural History was begun by the late E. Sibly, M. D., who made considerable progress in it before his decease;" but it is not stated that he was at all engaged in the Encyclopædia. Nor is the exact amount of headway made by him discernible at present, I think, in either book.

In the octavo work, the fourth, fifth, sixth, seventh and eighth volumes contain the ornithology, in the first four of which all the birds of Gmelin's edition of the Syst. Nat. are given, with some additions from Pallas, Turton, Pennant and others, with copious notes and translations well written and readable. The last, that is the eighth volume, is exclusively devoted to Le Vaillant, and contains a translation of nearly the whole of his Ois. d'Afrique and numerous copies of his plates. The latter were given previously in the Encyclopædia, but the text is much enlarged, and apparently nearly a literal translation, while in the Encyclopædia, where the species are named, usually only a short abstract of Le Vaillant's text is given. There are not many better popular Ornithologies, yet extant, than these same volumes of this "Genuine and Universal System of Natural History," and they deserve favorable mention, at least, alongside of anything in that line in the English language yet produced.

The following is a list of the species of birds named and described in the Encyclopædia Londinensis, those names having priority and consequent claim, valid in equity, being given in small capitals. The numbers of the species are the same as given in numerical order in the Linnæan genera to which they belong (in the Encyclopædia):

List of Birds named and described as new (but often erroneously) in the Encyclopædia Londinensis, with synonyms and references to plates, and straightened out, in general, according to the ability of the present editor.

Genus FALCO.

2. Falco griffardus, Wilkes, Encyc. Lond. vii. p. 173 (1805).
Falco bellicosus, Daud., Traite d'Orn. ii. p. 38 (1800).
Le Vaill., Ois. d'Afr. pl. 1. Encyc. Lond. vii. pl. 2.

3. Falco caffre, Wilkes, Ency. Lond. vii. p. 173 (1805).
Falco vulturinus, Daud., Traite d'Orn. ii. p. 53 (1800).
Le Vaill., Ois. d'Afr. i. pl. 6.

4. Falco remex, Wilkes, Ency. Lond vii. p. 174 (1805).
Falco ecaudatus, Daud., Tr. ii. p. 54 (1800).
Le Vaill., Ois. d'Afr. i. pl. 7, 8. Ency. Lond. vii. pl. 2.

41. Falco stridens, Wilkes. Ency. Lond. vii. p. 178 (1805).
Falco vocifer, Daud., Tr ii. p. 65 (1800).
Le Vaill., Ois. d'Afr. i. pl. 4. Ency. Lond. vii. pl. 4.

50. Falco capillamentus, Wilkes, Ency. Lond. vii. p. 179 (1805).
Falco occipitalis, Daud., Tr. ii. p. 40 (1800).
Le Vaill., Ois. d'Afr. i. pl. 2.

51. Falco longicaudus, Wilkes. Ency. Lond. vii. p. 180 (1805).
Falco albescens, Daud., Tr. ii. p. 45 (1800).
Le Vaill., Ois. d'Afr. i. pl. 3. Ency. Lond. vii. pl. 4.

56. Falco parasiticus, Wilkes. Ency. Lond. vii. p. 181 (1805).
Falco parasitus, Daud.. Tr. ii. p. 150 (1800).
Le Vaill., Ois. d'Afr. i. pl. 22 Ency. Lond. vii. pl. 5.

63. Falco rutilo niger, Wilkes, Ency. Lond. vii. p. 183 (1805).
Falco jakal, Daud., Tr. ii. p. 161 (1800).
Le Vaill. Ois. d'Afr. i. pl. 16.

64. Falco rutilo-griseus, Wilkes, Ency. Lond. vii. p. 183 (1805).
Falco desertorum, Daud.. Tr. ii. p. 162 (1800).
Le Vaill., Ois. d'Afr. i. pl. 17.

65. Falco bacha, Wilkes, Ency. Lond. vii. p. 184 (1805).
Falco bacha, Daud., Tr. p. 43 (1800).
Le Vaill., Ois. d'Afr. i. pl. 15. Ency. Lond. vii. pl. 6.

66. Falco manicatus, Wilkes, Ency. Lond. vii. p. 184 (1805).
Falco plumipes, Daud., Tr. ii. p. 163 (1800).
Le Vaill., Ois. d'Afr. i. pl. 18. Ency. Lond. vii. pl. 6.

67. Falco maculatus, Wilkes, Ency. Lond. vii. p. 184 (1805).
Falco tachardus, Daud., Tr. ii. p. 164 (1800).
Le Vaill., Ois. d'Afr. i. pl. 19.

68. Falco buserai, Wilkes, Ency. Lond. vii. p. 185 (1805).
Falco busarellus. Daud., Tr. ii. p. 168 (1800).
Le Vaill., Ois. d'Afr. i. pl. 20.

69. Falco buson, Wilkes, Ency. Lond. vii. p. 185 (1805).
Falco buson, Daud., Tr. ii. p. 168 (1800).
Le Vaill., Ois. d'Afr. i. pl. . Ency. Lond. vii. pl. 7.

79. Falco ranavorans. Wilkes, Ency. Lond. vii. p. 186 (1805).
Falco ranivorus, Daud., Tr. ii. p. 170 (1800).
Le Vaill., Ois. d'Afr. i. pl. 23.

91. Falco tachiro, Wilkes, Ency. Lond. vii. p. 187 (1805).
Falco tachiro, Daud., Tr. i. p. 90 (1800).
Le Vaill., Ois. d'Afr. i. pl. 24.

120. Falco albicans, Wilkes, Ency. Lond. vii. p. 190 (1805).
Falco lanarius, var. 2, Turton, Syst. Nat. i. p. 158.

124. Falco acolius, Wilkes, Ency. Lond. vii. p. 180 (1805).
Falco acoli, Daud., Tr. ii. p. 176 (1800).
Le Vaill., Ois. d'Afr. i. pl. 31.

125. Falco bengalensis, Wilkes, Ency. Lond. vii. p. 190 (1805).
Falco melanoleucus, Daud., Tr. ii. p. 85 (1800) ?
Le Vaill., Ois. d'Afr. i. pl. 32.

135. Falco piscator, Wilkes, Ency. Lond. vii. p. 192 (1805).
Falco frontalis, Daud., Tr. ii. p. 118 (1800).
Le Vaill., Ois. d'Afr. i. pl. 28.

136. Falco cantor, Wilkes, Ency. Lond. vii. p. 192 (1805).
Falco musicus, Daud. Tr. ii. p. 116 (1800).
Falco canorus, Thunberg, Dissert. Acad. iii. p. 265 (1801).
Le Vaill., Ois. d'Afr. i. pl. 27.

137. Falco africanus, Wilkes, Ency. Lond. vii. p. 193 (1805).
Falco tibialis, Daud., Tr. ii. p. 120 (1800).
Le Vaill., Ois. d'Afr. i. pl. 29.

138. Falco chicquera, Wilkes, Ency. Lond. vii. p. 193 (1805).
Falco chicquera, Daud., Tr. ii. p. 121 (1800).
Le Vaill., Ois. d'Afr. i. pl. 30.

145. Falco caracara, Wilkes, Ency. Lond. vii. p. 194 (1805).
Falco brasiliensis, Gm. Syst. Nat. i. p. 262?
"Caracara" Marcgrave.

Genus LANIUS.

11. Lanius Indus, Wilkes, Ency. Lond. xii. p. 211 (1812).
Lanius pendens, Lath., Ind. Orn. Supp. p. 19 (1801).
Le Vaill., Ois. d'Afr. ii. pl. 66, fig. 1.

14. LANIUS MAJOR, Wilkes. Ency. Lond. xii. p. 212 (1812).
Lanius icterus, Cuv., Reg. An. i. p. 352 (1829).
Tamnophilus olivaceus, Vieill., Gal. des Ois. i. p. 225 (1825).
Le Vaill., Ois. Afr. vi. pl. 285.

15. Lanius maximus, Wilkes, Ency. Lond. xii. p. 212 (1812).
Lanius dubius, Lath., Ind. Orn. Supp. p. 18 (1801).

17. Lanius javanensis, Wilkes, Ency. Lond. xii. p. 213 (1812).
Lanius superciliosus, Lath., Ind. Orn. Supp. p. 20 (1801).

18. Lanius Brubru, Wilkes, Ency. Lond. xii. p. 213 (1812).
Lanius Brubru, Lath., Ind. Orn. Supp. p. 20 (1801).
Le Vaill., Ois. Afr. ii. pl. 71.

19. Lanius cubla, Wilkes, Ency. Lond. xii. p. 214 (1812).
Lanius cubla, Lath., Ind. Orn. Supp. p. 20 (1801).
Le Vaill., Ois. d'Afr. ii. pl. 72, fig. 1, 2.

20. Lanius taciturnus, Wilkes, Ency. Lond. xii. p. 214 (1812).
Lanius silens, Shaw, Gen. Zool. vii. p. 330 (1809).
Le Vaill., Ois. Afr. ii. pl. 74.

21. Lanius oliva, Wilkes, Ency. Lond. xii. p. 214 (1812).
Lanius ollvaceus, Shaw, Gen. Zool. vii. p. 330 (1809).
Le Vaill., Ois. Afr. ii. pl. 75, 76.

67. Lanius picus, Wilkes, Ency. Lond. xii. p. 217 (1813).
Lanius mystaceus, Lath., Ind. Orn. Supp. p. 19 (1801).
Le Vaill., Ois. d'Afr. ii. pl. 65.

68. LANIUS DURUS, Wilkes, Ency. Lond. xii. p. 218 (1813).
Sparacta cristata, Vieill., Nouv. Dict. xxxi. p. 526 (1819).
Le Vaill., Ois. d'Afr. ii. pl. 79.

69. Lanius Geoffroyi, Wilkes, Ency. Lond. xii. p. 218 (1813).
Lanius plumatus, Shaw, Gen. Zool. vii. p. 292 (1809).
Prionops Geoffroyi, Vieill., Nouv. Dict. iii. p. 144 (1816).
Le Vaill., Ois. d'Afr. ii. pl. 80, 81.

Genus BUCEROS.

10. BUCEROS SEMILUNARIS, Wilkes, Ency. Lond. iii. p. 479 (1808).
Buceros lunatus, Temm., Pl. Col. liv. 92 (about 1830).
Le Vaill., Ois. Am. et Ind. pl. 13.

11. Buceros albicornis, Wilkes, Ency. Lond. iii. p. 479 (1808).
Buceros Pica, Scopoli, Flor. et Faun. Insub, p. 87 (1786)?
Buceros malabaricus, Gm., Syst. Nat. i. p. 359 (1788).
Buceros albirostris, Shaw, Gen. Zool. viii. p. 13 (1811).
Le Vaill., Ois. Am. et Ind. pl. 14.

12. Buceros violaceus, Wilkes, Ency. Lond. iii. p. 479 (1808).
Buceros violaceus, Shaw, Gen. Zool. viii. p. 19 (1811).
Le Vaill., Ois. Am. et Ind. pl. 19.

13. Buceros crispatus, Wilkes, Ency. Lond. iii. p. 479 (1808).
Buceros plicatus, Lath., Ind. Orn. i. p. 146 (1790).
Buceros undulatus, Shaw, Gen. Zool. viii. p. 26 (1811).
Le Vaill., Ois. Am. et Ind. pl. 20, 21.

14. Buceros Corvus, Wilkes, Ency. Lond. iii. p. 479 (1808).
Merops corniculatus, Lath., Ind. Orn. i. p. 276 (1790).
Tropidorhynchus corniculatus (Latham).
Le Vaill., Ois. Am. et Ind. pl. 24.

15. Buceros javanensis, Wilkes, Ency. Lond. iii. p. 479 (1808).
Buceros javanicus, Shaw. Gen. Zool. viii. p. 28 (1811).
Le Vaill., Ois. Am. et Ind. pl. 22.

16. Buceros gingala, Wilkes, Ency. Lond. iii. p. 480 (1808).
Buceros gingalensis, Shaw, Gen. Zool. viii. p. 37 (1811).
Le Vaill., Ois. Am. et Ind. pl. 23.

17. Buceros longibandus, Wilkes, Ency. Lond. iii. p. 480 (1808).
Buceros fasciatus, Shaw, Gen. Zool. viii. p. 34 (1811).
Le Vaill., Ois. Afr. v. pl. 233.

18. Buceros coronatus, Wilkes, Ency. Lond. iii. p. 480 (1808).
Buceros melanoleucus, Licht.
Buceros coronatus, Shaw, Gen. Zool. viii. p. 35 (1811).
Le Vaill., Ois. Afr. v. pl. 234, 235.

Genus CORVUS.

2. Corvus capistrum, Wilkes, Ency. Lond. v. p. 237 (1802).
Corvus albicollis, Lath., Ind. Orn. i. p. 151 (1790).
Corvus cafer, Licht.
Le Vaill., Ois. Afr. ii. pl. 50.

3. Corvus magnus, Wilkes, Ency. Lond. v. p. 237 (1802).
Corvus major, Vieill., Nouv. Dict. viii. p. 27 (1817).
Le Vaill., Ois. Afr. ii. pl. 51.

39. Corvus splendidus, Wilkes, Ency. Lond. v. p. 241 (1802).
Corvus splendidus, Shaw, Gen. Zool. vii. p. 372 (1809).
Le Vaill., Ois. Afr. ii. pl. 85.

41. Corvus afer, Wilkes, Ency. Lond. v. p. 241 (1802).
Corvus capensis, Licht.
Le Vaill., Ois. Afr. ii. pl. 52.

44. Corvus indicus, Wilkes, Ency. Lond. v. p. 242 (1802).
Corvus crinitus, Daud., Traite d'Orn. ii. p. 253 (1800).
Corvus sexsetaceus, Shaw, Gen. Zool. vii. p. 380 (1809.)
Le Vaill., Ois. Afr. ii. pl. 82.

45. Corvus Choucador, Wilkes, Ency. Lond. v. p. 243 (1802).
Sturnus ornatus, Daud., Traite d'Orn. ii. p. 309 (1800).
Le Vaill., Ois. Afr. ii. pl. 86.

48. Corvus cirrhatus, Wilkes, Ency. Lond. v. p. 244 (1802).
Pica melanocephala, Wagler, Syst. Av. (1827).
Le Vaill., Ois. Afr. ii. pl. 58.

57. Corvus piapiac, Wilke², Ency. Lond. v. p. 245 (1802).
Corvus senegalenses, Linn., Syst. Nat. i. p. 158 (1766).
Le Vaill., Ois. Afr. ii. pl. 54.

58. Corvus ruber, Wilkes, Ency. Lond. v. p. 245 (1802).
Corvus rufigaster, Lath., Ind. Orn. i. p. 26 Supp. (1801).
Le Vaill., Ois. Afr. ii. pl. 55.

59. Corvus Temia, Wilkes, Ency. Lond. v. p. 245 (1802).
Corvus varians, Lath., Ind. Orn. Supp. p. 26 (1801).

60. Corvus rufus, Wilkes, Ency. Lond. v. p. 245 (1802).
Lanius rufus, Scop., Flor. et Faun. Insub. i. p. 86 (1786).
Le Vaill., Ois. Afr. ii. pl. 59.

61. Corvus Lanius, Wilkes, Ency. Lond. v. p. 245 (1802).
Lanius picatus, Lath., Ind. Orn. Supp. p. 17 (1801).
Le Vaill., Ois. Afr. ii. pl. 60.

Genus ORIOLUS.

23. Oriolus africanus, Wilkes, Ency. Lond. xvii. p. 740 (1820).
Oriolus monachus, Wagler, Syst. Av. (1827).
Oriolus Coudougnan, Temm., Pl. Col. liv. 54 (about 1826).
Oriolus larvatus, Licht., Verz. p. 20 (1823).
Le Vaill., Ois. d'Afr. vi. pl. 261, 262.

Genus PICUS.

49. Picus barbatus, Wilkes, Ency. Lond. xx. p. 401 (1825).
Picus biarmicus, Cuv.
Picus namaquus, Licht., Verz. p. 17 (1823).
Picus myctaceus, Vieill., Nouv. Dict. xxvi. p. 73 (1818).
Le Vaill., Ois. Afr. vi. pl. 251, 252.

58. Picus erythrocephalus, Wilkes, Ency. Lond. xx. p. 402 (1825).
Picus fulviscapus, Licht., Verz. p. 11 (1823).
Picus fuscescens, Vieill., Nouv. Dict. xxvi. p. 86 (1818).
Le Vaill., Ois. Afr. vi. pl. 253.

Genus MEROPS.

28. Merops monachus, Wilkes, Ency. Lond. xv. p. 159 (1817).
From New Holland. I cannot determine this species.

29. Merops malimbicus, Wilkes, Ency. Lond. xv. p. 159 (1817).
Merops bicolor, Daud., Ann. du Mus. ii. p. 440 (1803).

Genus LARUS.

1. Larus rissa, Wilkes, Ency. Lond. xii. p. 250 (1813).
Larus rissa, Brunnich, Orn. Bor. p. 42 (1764)?

Genus ALAUDA.

2. Alauda rostro-crassa, Wilkes, Ency. Lond. i. p. 235 (1808).
Alauda crassirostris, Vieill., Nouv. Dict. i. p. 373 (1816).
Le Vaill., Ois. d'Afr. iv. pl. 193.

25. Alauda percutiens, Wilkes, Ency. Lond. i. p. 236 (1808).
Alauda apiata, Vieill., Nouv. Dict. i. p. 342 (1816).
Le Vaill., Ois. d'Afr. iv. pl. 194.

26. Alauda africana, Wilkes, Ency. Lond. i. p. 236 (1808).
Alauda africana, Gm., Syst. Nat. i. p. 798 (1788).
Le Vaill., Ois. d'Afr. iv. pl. 192.

37. Alauda dorso-rubra, Wilkes, Ency. Lond. i. p. 236 (1808).
Alauda pyrrhonota, Vieill., Nouv. Dict. i. p. 361 (1816).
Le Vaill., Ois. d'Afr. iv. pl. 197.

38. Alauda pileo-rubra, Wilkes, Ency. Lond. i. p. 236 (1808).
Alauda rufipilea, Vieill., Nouv. Dict. i. p. 345 (1816).
Le Vaill., Ois. d'Afr. iv. pl. 198.

Genus AMPELIS.

1. Ampelis grandis, Wilkes, Ency. Lond. i. p. 483 (1796).
Coracias militaris. Lath., Ind. Orn. Supp. p. 27 (1801).
Querula rubra, Vieill.
Hæmatoderus grandis, (Wilkes) !!!
Le Vaill., Ois. Am. et Ind. pl. 25, 26.

Genus MUSCICAPA.

3. Muscicapa nubila, Wilkes, Ency. Lond. xvi. p. 260 (1818).
Sylvia nebulosa, Vieill., Nouv. Dict. xi. p. 204 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 149.

4. Muscicapa loricaria, Wilkes, Ency. Lond. xvi. p. 261 (1818).
Sylvia melanoleucus, Vieill., Nouv. Dict. xi. p 176 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 150.

19. Muscicapa parus, Wilkes, Ency. Lond. xvi. p. 262 (1818).
Muscicapa subflava, Vieill., Nouv. Dict. xxi. p. 483 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 155.

39. Muscicapa penulata, Wilkes, Ency. Lond. xvi. p. 265 (1818).
Muscicapa cyanomelas, Vieill., Nouv. Dict. xxi. p. 473 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 151.

40. Muscicapa superciliata, Wilkes, Ency. Lond. xvi. p. 265 (1818).
Muscicapa perspicillata, Vieill.
Le Vaill., Ois. d'Afr. iv. pl. 152.

106. Muscicapa undulata, Wilkes, Ency. Lond. xvi. p. 269 (1818).
Muscicapa ——— ? Gray, Gen. i. p. 263.
Le Vaill., Ois. d'Afr. iv. pl. 156.
Not *M. undulata*, Vieill., Nouv. Dict. xxi. p. 471 (1818).

107. Muscicapa stellata, Wilkes, Ency. Lond. xvi. p. 270 (1818).
Muscicapa stellata, Vieill., Nouv. Dict. xxi. p. 468 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 157.

108. Muscicapa azurufa, Wilkes, Ency. Lond. xvi. p. 270 (1818).
Muscicapa aurea, Vieill., Nouv. Dict. xxi. p. 463 (1818).
"Niltava azurea (Vieill)," Gray, Gen. i. p. 264.
Le Vaill., Ois. d'Afr. iv. pl. 158.

109. Muscicapa albicapilla, Wilkes, Ency. Lond. xvi. p. 270 (1818).
"Platysteira monacha, Swains."
Le Vaill., Ois. d'Afr. iv. pl. 159.

110. Muscicapa molenaria, Wilkes, Ency. Lond. xvi. p. 270 (1818).
Muscicapa pistrinaria, Vieill., Nouv. Dict. xxi. p. 474 (1818).
Muscicapa molitor, Licht.
Le Vaill., Ois. d'Afr. iv. pl. 160.

111. Muscicapa pririt, Wilkes, Ency. Lond. xvi. p. 271 (1818).
Muscicapa pririt, Vieill., Nouv. Dict. xxi. p. 486 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 161.

112. Muscicapa drongo, Wilkes, Ency. Lond. xvi. p. 271 (1818).
Lanius forficatus, Linn., Syst. Nat. i. p. 134 (1766).
Le Vaill., Ois. d'Afr. iv. pl. 166.

116. Muscicapa albiventris, Wilkes, Ency. Lond. xvi. p. 272 (1818).
Dicrurus leucogaster, Vieill. Nouv. Dict. ix. p. 587 (1817).
Dicrurus albiventris, Steph., Gen. Zool. xiii. p. 140 (1825).
Le Vaill., Ois. d'Afr. iv. pl. 171.

117. Muscicapa longicauda, Wilkes, Ency. Lond. xvi. p. 272 (1818).
Dicrurus macrocercus, Vieill., Nouv. Dict. ix. p. 588 (1817).
Dicrurus indicus, Steph., Gen. Zool. xiii. p. 139 (1825).
Le Vaill., Ois. d'Afr. iv. pl. 174.

118. Muscicapa malabarica, Wilkes, Ency. Lond. xvi. p. 272 (1818).
Lanius malabaricus, Scopoli.
Dicrurus platurus, Vieill., Nouv. Dict. ix. p. 588 (1817).
Le Vaill., Ois. d'Afr. iv. pl. 175.

119. Muscicapa ærea, Wilkes, Ency. Lond. xvi. p. 272 (1818).
Dicrurus æneus, Vieill, Nouv. Dict. ix. p. 586 (1817).
Dicrurus æratus, Steph., Gen. Zool. xiii. p. 138 (1825).
Le Vaill., Ois. d'Afr. iv. pl. 176

Genus MOTACILLA.

2. Motacilla coryphæus, Wilkes, Ency. Lond. xvi. p. 77 (1817).
Sylvia coryphæus, Vieill., Nouv. Dict. xi. p. 177 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 120.

16. Motacilla citrina, Wilkes, Ency. Lond. xvi. p. 78 (1817).
Sylvia subflava, Vieill., Nouv. Dict. xi. p. 175 (1817).
L. Vaill., Ois. d'Afr. iii. pl. 127.

21. Motacilla melogaster, Wilkes, Ency. Lond. xv. p. 79 (1817).
Sylvia lunulata, Vieill., Nouv. Dict. xi. p. 210 (1817).
Sylvia gutturalis, Boie.
Le Vaill., Ois. d'Afr. iii. pl. 123.

22. Motacilla ruficapa, Wilkes, Ency. Lond. xvi. p. 80 (1817).
Sylvia fulvicapilla, Nouv. Dict. xi. p. 217 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 124.

23. Motacilla viridis, Wilkes, Ency. Lond. xvi. p. 80 (1817).
Sylvia olivacea, Vieill., Nouv. Dict. xi. p. 205 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 125.

24. Motacilla grisea, Wilkes, Ency. Lond. xvi. p. 80 (1817).
Sylvia subcœrulea, Vieill., Nouv. Dict. xi. p. 188 (1817).
Parisoma rufiventer, Swains.
Le Vaill., Ois. d'Afr. iii. pl. 126.

26. Motacilla ciliata, Wilkes, Ency. Lond. xvi. p. 80 (1817).
Sylvia diophrys, Vieill., Nouv. Dict. xi. p. 182 (1817).
Motacilla diophrys, Shaw, Nat. Misc. xxiii. pl. 973 (no date).
Le Vaill., Ois. d'Afr. iii. pl. 128.

39. Motacilla aurata, Wilkes, Ency. Lond. xvi. p. 83 (1817).
Sylvia auraticollis. Vieill., Nouv. Dict. xi. p. 175 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 119.

66. Motacilla arenaria, Wilkes, Ency. Lond. xvi. p. 85 (1817).
Motacilla capensis, Linn., Syst. Nat. i. p. 333 (1766).
Le Vaill., Ois. d'Afr. iv. pl. 178.

67. Motacilla variegata, Wilkes, Ency. Lond. xvi. p. 86 (1817).
Motacilla indica, Gm., Syst. Nat. i. p. 962 (1788).
Motacilla variegata, Vieill.
Le Vaill., Ois d'Afr. iv. pl. 179.

68. Motacilla striata, Wilkes, Ency. Lond. xvi. p. 86 (1817).
Œnanthe ptymatura, Vieill., Nouv. Dict. xxi. p. 436 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 188, fig. 2.

69. Motacilla rubra, Wilkes, Ency. Lond. xvi. p. 86 (1817).
Œnanthe rufiventris, Vieill., Nouv. Dict. xxi. p. 431 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 188, fig. 1.

70. Motacilla cursor, Wilkes, Ency. Lond. xvi. p. 86 (1817).
Œnanthe cursorea, Vieill., Nouv. Dict. xxi. p. 431 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 190.

71. Motacilla familiaris, Wilkes, Ency. Lond. xvi. p. 86 (1817).
Œnanthe sperata, Vieill, Nouv. Dict. xxi. p. 432 (1818).
Saxicola familiaris, Steph., Gen. Zool. xiii. p. 241 (1825).
Le Vaill., Ois. d'Afr. iv. pl. 183.

80. Motacilla formicivora, Wilkes, Ency. Lond. xvi. p. 88 (1817).
Œnanthe formicivora, Vieill., Nouv. Dict. xxi. p. 421 (1818).
Saxicola formicivora, Steph., Gen. Zool. xiii. p. 242 (1825).
Le Vaill., Ois. d'Afr. iv. pl. 186, 187.

81. Motacilla Imperator, Wilkes, Ency. Lond. xvi. p. 88 (1817).
Œnanthe nigra, Vieill., Nouv. Dict. xxi. p. 431 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 189.

82. Motacilla Alauda, Wilkes, Ency. Lond. xvi. p. 88 (1817).
Alauda nigra, Stephens, Gen. Zool. xiv. p. 25 (1826).
L. Vaill., Ois. d'Afr. iv. pl. 191.

86. Motacilla tractrac, Wilkes, Ency. Lond. xvi. p. 89 (1817).
Œnanthe cinerea, Vieill, Nouv. Dict. xxi. p. 437 (1818).
Le Vaill., Ois. d'Afr. iv. pl. 184, fig. 1.

87. Motacilla montana, Wilkes, Ency. Lond. xvi. p. 89 (1817).
Œnanthe monticola, Vieill., Nouv. Dict. xxi. p. 434 (1818).
Saxicola Montana, Steph., Gen. Zool. xiii. p. 242 (1825).
Le Vaill., Ois. d'Afr. iv. pl. 184, fig. 2.

93. Motacilla pastor, Wilkes, Ency. Lond. xvi. p. 90 (1817).
Saxicola rubicola, var. Caffra, Licht.
Le Vaill., Ois. d'Afr. iv. pl. 180.

96. Motacilla turdus, Wilkes, Ency. Lond. xvi. p. 91 (1817).
Sylvia leucophrys, Vieill., Nouv. Dict. xi. p. 191 (1817).
Turdus pipiens, Steph., Gen. Zool. xiii. p. 202 (1826).
Le Vaill, Ois. d'Afr. iv. pl. 118.

98. Motacilla acutipennis, Wilkes, Ency. Lond. xvi. p. 91 (1817).
Sylvia oxyura, Vieill., Nouv. Dict. xi. p. 161 (1817).
Le Vaill., Ois. d'Afr. iv. pl. 133.

99. Motacilla Amboynensis, Wilkes, Ency. Lond. xvi. p. 91 (1817).
Sylvia rubescens, Vieill.
Le Vaill., Ois. d'Afr. iv. pl. 136.

46. Motacilla teheric, Wilkes, Ency. Lond. xvi. p. 94 (1817).
Motacilla madagascariensis, Gm., Syst. Nat. i. p. 981 (but not p. 952).
Sylvia leucops, Vieill., Nouv. Dict. xi. p. 222 (1817).
Le Vaill., Ois. d'Afr. iv. pl. 132.

88. Motacilla garrula, Wilkes, Ency. Lond. xvi. p. 97 (1817).
Sylvia babæcula, Vieill., Nouv. Dict. xi. p. 172 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 121, fig. 1.

89. Motacilla isabella, Wilkes, Ency. Lond. xvi. p. 98 (1817).
Sylvia bæticata, Vieill., Nouv. Dict xi. p. 195 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 121, fig. 2.

90. Motacilla pavo, Wilkes, Ency. Lond. xvi. p. 98 (1817).
Sylvia brachyptera, Vieill., Nouv. Dict. xi. p. 206 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 122.

09. Motacilla fimbriata, Wilkes, Ency. Lond. xvi. p. 102 (1817).
Malurus palustris, Vieill., Nouv. Dict. xx. p. 213 (1818)?
Malurus gularis, Steph., Gen. Zool. xiii. p. 224 (1825).
Le Vaill., Ois. d'Afr. iii. pl. 130, fig. 2.

10. Motacilla pinċpinc, Wilkes, Ency. Lond. xvi. p. 102 (1817).
Sylvia textrix, Vieill., Nouv. Dict. xi. p. 208 (1817).
Le Vaill., Ois. d'Afr. iii. pl. 131.

11. Motacilla apus, Wilkes, Ency. Lond. xvi. p. 103 (1817).
Sylvia minuta, Shaw, Nat. Misc. xxiii. pl. 997 (no date).
Le Vaill., Ois. d'Afr. iii. pl. 134.

12. Motacilla curvata, Wilkes, Ency. Lond. xvi. p. 103 (1817).
Motacilla rufescens, Vieill.
Le Vaill., Ois. d'Afr. iii. pl. 135.

Genus PARUS.

3. Parus niger, Wilkes, Ency. Lond. xviii. p. 726 (1821).
Parus niger, Vieill, Nouv. Dict. xx. p. 325 (1818).
Parus luctuosus, Licht.
Le Vaill., Ois. d'Afr. iii. pl. 137.

4. Parus variegatus, Wilkes, Ency. Lond. xviii. p. 726 (1821).
Parus cinerascens, Vieill., Nouv. Dict. xx. p. 316 (1818).
Le Vaill., Ois. d'Afr. iii. pl. 138.

5. Parus fuscus, Wilkes, Ency. Lond. xviii. p. 726 (1821).
Parus fuscus, Vieill., Nouv. Dict. xx. p 309 (1818).
Le Vaill., Ois. d'Afr. iii. pl. 139, fig. 1.

6. Parus albigena, Wilkes, Ency. Lond. xviii. p. 727 (1821).
Parus cinereus, Vieill., Nouv. Dict. xx. p. 316 (1818).
Parus atriceps, Horsf., Linn. Trans. xiii. p. 160.
Le Vaill., Ois. d'Afr. iii. pl. 139, fig. 2.

7. Parus dubius, Wilkes, Ency. Lond. xviii. p. 727 (1821).
Sylvia atricapilla, Vieill., Nouv. Dict.
Parus monachus, Gray, Gen. iii. p. 30, b.
Le Vaill, Ois. d'Afr. iii. pl. 140.

8. Parus quadricolor, Wilkes, Ency. Lond. xviii. p. 727 (1821).
Motacilla zeylonica, Gm., Syst. Nat. i. p. 964 (1788).
Ægithina quadricolor, Vieill.
Le Vaill., Ois. d'Afr. iii. pl. 141.

On the habits of a TIPULIDEOUS LARVA.

BY EDW. D. COPE.

There has been known in Europe for many years a small white larva, which is called the army worm, which gathers itself into large bodies forming streams of several feet in length. These bodies move forward at a slow rate, and appear to be a form of migration which the species adopts for some purpose unknown. Their superficial resemblance to a sluggish serpent usually excites repugnance in the minds of many observers. It has been found that these larvæ are those of different species of the flies of the genus Sciara, which belongs to the Mycetophilidæ, which was formerly regarded as a group of the great family Tipulidæ, or the crane flies.

Of this genus Osten Sacken* says: "All the larvæ of the Mycetophilidæ are gregarious, and live among decaying vegetable matters. * * Sciara is found among decaying leaves in vegetable mould, in cow-dung, under the bark of dead trees, etc. * * They may be distinguished from the larvæ of Mycetophila by their greater delicacy, and by the structure of the tropbi; most of them seem to have no bristles or spines on the locomotive processes on the under side of the body, whereas the majority of the Mycetophilæ have them. They are even more gregarious than the other larvæ of this family, and have the singular propensity of sticking together in dense patches, in which situation they are frequently found, for instance, under the bark of trees. It is probably to the same propensity that the phenomenon, known in Germany under the name of army worm (Heerwurm), is due. This is a procession of larvæ, sometimes from twelve to fourteen feet long, and two or three inches broad, consisting of numberless specimens, sticking closely together, and forming a layer of about half an inch thickness. Such processions have been often observed in woods in Germany, Sweden and Russia, but never sufficiently investigated to explain their object. That the larvæ do not migrate in search of food, we can infer from the fact that they appear to be full-grown when they form these processions."

Prof. Berthold, of the University of Göttingen, gives a more detailed account of this larva,† as follows:

"Mr. Berthold imparted, on the 17th of December, 1853, to the Royal Society of Sciences, a zoological examination of the Heerwurm (army worm), which in certain years in the forests of Thuringia, Hanover, Sweden and Norway moves like a snake several feet long, four to six inches broad, and thumb thick, which consists of myriads of small dipterous larvæ, four to five lines long. Eight years ago (Reports from the G. A. University and the Royal Society of Sciences at Goettingen, 1845, No. 5), he stated that the Tipula which was observed by the forest keeper, Mr. Raude, at Birkenmoor, was the Thomastrauer gnat (Sciara t h o m æ), and was the means of solving a problem, which has been for hundreds of years a returning stimulus of bigotry and fear for the peasants, and for zoologists a point of earnest consideration. But when he obtained last summer from the Eilenriede, near Hanover, more new Heerwurm larvæ, and Mr. L. Bechstein bred some flies out of the larvæ of a Heerwurm, it gave him occasion to institute further examinations.

"The desire for association and migration cannot be compared with the migrations of all other insects and animals; for this is not done to procure nourishment, because the maggots are in such great quantity above each other, that but few would have a chance to reach the food. Also, the maggots do not show the desire for travelling immediately after leaving the egg, like many other insects, but the movement commences when the worm

* Who has described the larvæ, and given the bibliography of the European species, Proc. Entom. Soc. Phila. 1854. 163—170. I am indebted to this excellent entomologist for the identification of larvæ from Westtown, sent him, and for reference to the above essay.

† Nachrichten Univ. Göttingen, 1854, p. 1.

is grown, and not less than three lines long. From this it would appear to have some connection with the entrance into the pupa state.

"Their metamorphosis is known; it takes place in earth, in roots of plants, under rotten logs, or in swamps. Such moist localities are selected by the Heerwurm larvæ after they have come to a certain age, and the time of pupa change has arrived, which is known by the desire for association.

"The mucus which keeps the maggots together is a product of the salivary gland in Sciara i n g e n u a, and almost all other Dipterous larvæ which have a head, and which make a fine cocoon. The formation of pupæ of the Heerwurm takes place surrounded by this mucous saliva. The Heerwurm can be regarded as a collection of larvæ, for the purpose of mutual transformation; that is, it is accomplished through mutual protection at a period favorable to development. This connection is given up before the formation of nymphs really arrives, the individuals separating, from time to time, in search of food. When now the larvæ of large divisions of Diptera, as the Pupipares, Notacanthes, etc., have the peculiarity of changing their own skin into a cover, which is the grave of the larva and the cradle for the pupa; and the larvæ of another division of the Diptera, as the Tanystomes and the Nemoceres, before changing, strip off their cover, and are transformed free or in a cocoon, so the Sciara t h o m æ presents a process intermediate between these, as the construction of the cocoon is not performed within the skin of the larva itself, but in a cavity which is made of the skins of numbers of other larvæ."

There appears, however, to have been no record of the observation of this peculiar habit of larvæ in North America, up to within a short time. The genus is known to exist here, and Osten Sacken (l. c.) describes a species which he calls Sciara t o x o n e u r a. Hence the following account, which I have received from my friend William Kite, teacher at Westtown School, in Chester county, Pa., is of considerable interest. The statements are those of a careful naturalist, well acquainted with the field and field study. Before quoting it, it must be noted that another account of the same phenomenon was published in The Friend journal (Philada., 1864), by Charles Potts, another teacher in the same excellent institution. Some statements of this writer need correction, as further observation convinced him: *e. g.*, that they could climb.

The following are observations of Wm. Kite:—

"On the morning of Ninth month 11th, 1866, a company of worms was observed crossing the brick walk, or passage, east of Westtown School; the mass presented much the appearance of a thin grey snake. This is the third year that these worms have been seen about our grounds.

"This company extended over a length of about twenty-two inches, with a breadth of from three-quarters of an inch in the thickest part, to about one-eighth of an inch at the head, and one-tenth at the tail; five or six worms deep in thicker parts. The mode of progression of these singular creatures was by the contraction of an annulus at a time. They had distinct heads, and the motion of each was like that observed in caterpillars rather than that seen in earth-worms. The contraction commenced posteriorly, and was passed forward to the head in the successive rings.

"They advanced at the rate of four inches in five minutes, the hinder ones working their way over the top of the rest. Those who reached the ground or bricks by thus traversing their comrades' backs seemed unable to proceed, so that their progression naturally assumed the singular shape that drew our attention to them. Occasionally a few would diverge from the mass, near the front, forming another head, as it were; but they would soon return to the general company by crawling back over each other."

[This observation was also made on the procession which appeared in 1864; *i. e.*, that the hinder ones progressed over the bodies of those that preceded, the whole mass thus taking up in the rear and laying down in front. This is a much more rational explanation of their progress than has been offered; we

having been left to suppose that the lower stratum of larvæ carry the general mass.—E. D. C.]

"To arrive at an idea of their numbers, about half an inch of them were lifted out of their ranks on the point of a knife; of these 95 adhered to it, giving say 200 to the inch, or, by rough estimation, 2400 in the party.

"They were about half an inch long, semi-transparent, with black heads; their alimentary canals were clearly distinguishable by the unaided eye; the color of their contents would lead to the supposition that their food resembled that of the earth-worm. They crossed the brick path, conforming to one general direction, but varying to suit the inequalities of the walk. On reaching the grass they immediately buried themselves in the ground. This was observed to happen with a company which was seen here a year or two ago."

"*Seventh mo.* 1. 1867.

"A large company of the 'snake worms' attempted to cross a gravel walk in the yard this morning, but became entangled in the sand, which adhered to their bodies and seemed to bewilder them. School duties interfered with watching them, but I anticipated their perishing in the sand. They had managed to keep together when I saw them, after having crawled through three or four feet of sandy gravel, and may have eventually escaped.

"The most noticable fact in regard to them was the presence among them, travelling with and over them, of a full-grown maggot of a fly! It was very lively, diving into the mass and emerging again, as though quite at home. How did it get there? and why did it associate with them? Was it hatched among them?

"Their course was about N. W."

"*Seventh mo.* 5, 1867.

"A small company of *those worms* again on the gravel walk, within a few feet of the same place as on the 1st inst. As they were going in an opposite direction from those on the 1st, they may be the same company. There were several many-footed worms, about an inch long, accompanying them; these were engaged in pulling worms out of the procession and devouring them. On both occasions the companies were noticed early in the morning, as though they commenced moving in the night.

"Their course was about S."

"*Seventh mo.* 8, 1867.

"A much larger company of these worms were on the brick walk. They had nearly crossed the walk before 7 A. M., showing they commenced moving early in the morning. They appeared unusually lively. Upon careful examination, we found the train extending back into the grass eighteen inches to a cluster of them which appeared to be issuing out of the ground. They moved on the surface of the ground, winding among the grass to avoid the stems. This disproves our former supposition that they emerged to avoid some obstruction. We were necessarily called off, and on our return the traces of them were lost. Some ants and one small worm seemed engaged in eating them; the worms apparently appreciated their danger, shrinking from the touch of these animals. This procession measured six feet six inches. Occasionally one would be left on the ground after the train had passed, but most of them kept with the general mass.

"Their course was about N. W."

"*Seventh mo.* 9, 1867.

"Two more small companies of these worms appeared, apparently the remains of the large party of yesterday. Each company was short of a foot in length, and were accompanied by quite a number of the worms noticed before with them. I caught and preserved a number of these; they resemble the worms found in cured meat, or similar ones found in many garden vegetables. Their connection with the emigrant parties seems to be that of enemies, preying on them.

"Course N. W."

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"*Seventh mo.* 15, 1867.

"7 *o'clock.*—A cool morning. Found a small company of these worms on the brick walk near the office. Some passer had trod on them, and they were thrown into confusion; added to this, a colony of ants had intercepted their course, and carried them off in numbers. They were massed in a crowd, and their efforts to move on were defeated by the ants seizing their leaders at each attempt to move.

"8.30.—The perseverance of the ants in carrying away the worms seems to demoralize them entirely, and finally two bricks being placed to protect them from passers' feet, the greater portion of them crept under one of them and huddled together in a confused mass, where they became an easy prey to their indefatigable little enemies, who were to be seen through the morning marching off with their captives, though much larger than themselves.

"10 o'clock.—All gone.

"Course, so far as they were permitted to go, N. W."

The "many-footed worms" which devoured the Sciara larvæ were larvæ of some species of the Coleopterous family Staphylinidæ. Several specimens were sent with the Sciaræ.

I am also informed that a procession of this species has been seen on Quaker Hill, in the borough of West Chester. Dr. Benj. H. Coates informs me that he has seen their trains in Hunterdon county, N. J., and T. A. Conrad saw them some years ago in his garden in Burlington, in the same State.

On inquiry of my friend Jacob Stauffer, of Lancaster, whose MS. notes on the species of insects of his region, and their habits, are numerous, I received the following additions to our stock of knowledge of the habits of the larva of the Sciara:

"On the 10th of August, 1865, Mr. Rathvon and myself were informed by Dr. Geo. McCalla that we would be interested by examining an army of small shining worms on the march in the yard of Col. D. Patterson, in W. King street, Lancaster.

"On our arrival we found the order of march thrown into great confusion by boiling water, which the women had poured along the line. I collected quite a number of stragglers from the main army thus routed, as did also friend Rathvon. These I subjected to a close examination under a strong magnifying power. My notes read thus: 'A portion, about two feet in length, looked like a shining cord, not uniform in outline, yet compact. These larvæ were about half an inch long mostly, perhaps three-eighths of an inch, and seven-sixteenths and one-thirty-second parts of an inch in diameter. Their heads of a glossy jet-black color, as also the anterior edge of the first joint of segment: rest of the first, and the second and third joints of a translucent milky-white, dorsally watery, with an interior wavy, brownish, intestinal canal, visible through the transparent skin; there is also a lateral tinge or bronze-yellow; otherwise of a shining, water-and-milk-like color. I could observe no pectoral or anal legs; they moved by contracting and extending the segments of their body (twelve in number) alternately, like that of a dipterous larva of Tipulidæ. In motion the convolutions of the intestinal canal were very apparent. They seemed to interlace with each other, but, having been disturbed, I cannot venture to say whether after any precise order, or by simple conglomeration as chance may demand. When first seen they were moving in a broad columnar mass, rope-like, seeming like a shining guard-chain cord, of considerable thickness and quite ornamental, like jet beads mixed in with pearly-white beads in motion.'

"The following is a copy from a letter by Prof. W. S. Roedel, Wytheville, Virginia, Aug. 4. 1865, in his own words:

"'On Saturday, July 15, 1865, at North Lebanon, Pa., I observed in a path at the foot of a hill, what I at first glance supposed to be the cast-off skin of a serpent, which the object resembled in color and general appearance, but what,

upon close inspection, I found to be a multitude of caterpillars, a half-inch in length and one-thirty-second part of an inch in diameter; head of a dull red or brownish color, bodies smooth and somewhat glistening.

"These worms moved upon one another, piled upon and irregularly interwoven among each other like a flattened rope. The head of the column was much broader than the rest, being two inches wide, from which dimension the column gradually tapered (to a point, I suppose, for I did not see the end of it). The length of the column was four feet to a fence, beyond which I did not examine it.

"'A portion of the column lay in the grass, through which it moved without interruption, as if it had been a solid mass. The rate of motion was extremely slow, not exceeding one-eighth of an inch in a minute. The color of the mass was as much like a rope of tow which has been exposed to the weather as anything I can think of; it might be called a rusty gray. The column was not cylindrical,—that is, a cross section would be elliptical.'

"The Springfield (Mass.) Republican of August, 1865, gives an account of a 'reptile' found at Lee. It was nearly four feet in length, about the size of a man's finger, and shaped like a whip-lash; and on close examination the whole body was found to be composed of small worms about half an inch in length, with large black heads, and semi-transparent body. On separating them into fragments, they would immediately re-form into a snake shape, and crawl slowly off. One or two similar snakes have recently been seen in that vicinity.' This was copied into the Lancaster Evening Express of Saturday, Aug. 12, 1865."

The Mechanical Theory of SOLAR HEAT.

BY JACOB ENNIS.

During the last quarter of a century scientific men have endeavored by new methods to account for the heat of the sun, and they now generally believe, or incline to believe, in its mechanical origin. Some adopt the meteoric theory. They suppose that meteorites are falling with great velocity in the sun, and that these stones strike the enormous solar fire by their fall. Others adopt the nebular theory. They suppose that the sun and all his attending planets and satellites have condensed from a very rare nebulous condition, and that the mere condensation, or falling together of their materials by the force of gravity, has produced all the solar heat. Others again combine both these theories. They believe that originally the sun and the earth were heated to a fused condition by mere condensation, and that since then the meteorites have continued the heat of the sun. The only source of heat by all these theories is gravity, because gravity causes the fall of matter, whether in a nebulous or a meteoric condition, and this falling, this mechanical force, is converted into heat. My object in this paper is to show that none of these views can stand the test of numbers and of well established facts. The high place which the mechanical theory of solar heat now holds in the scientific world, is my apology for this appearance.

Some of the important statements of the highly distinguished gentlemen who have formed the mechanical theory are these:

I. Dr. Julius Robert Mayer, of Heilbronn, says that a mass of burning coal equal to that of the sun would supply his present emission of heat only 4600 years; and that a meteorite falling into the sun would supply at least 4600 times more heat than the same weight of burning coal. Hence a mass of meteorites equal to the sun would supply his heat $4600 \times 4600 = 21{,}160{,}000$ years. This would be the least amount of heat when, as is most natural, that mass of meteorites should approach the sun spirally. If they should fall in a direct line, as would be most unlikely, the heat would be double this amount. This greatest possible amount of heat, being out of probability, is

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not taken into the account. Let it be clearly understood that the above 21,160,000 years of heat are to be derived not from the materials of the sun falling together, but from a mass of meteorites equal to the sun falling into the sun; the gravity of the sun not being thereby increased. The substance of the meteorites are supposed, by Mayer's theory, to be radiated away into space just as fast as they fall. The two ideas are vastly different. But how long would be the duration of solar heat by the mere falling together of the solar mass from infinite space? We may compute an answer from other statements of these gentlemen, as follows:

II. Speaking of the enlargement of the sun by the continued fall of meteorites, Dr. Mayer says: "the increase of volume could scarcely be appreciated by man; for if the specific gravity of these cosmical masses be assumed to be the same as that of the sun, the enlargement of his apparent diameter to the extent of one second, the smallest appreciable magnitude, would require from 33,000 to 66,000 years." These two periods are derived, the one from the spiral and the other from the direct fall. We will take the most probable medium,—say 41,360 years. A second of measure at the distance of the sun is about 470 miles. These turned into feet would be $470 \times 5280 = 2{,}481{,}600$ feet. An increase in the sun's diameter this number of feet in 41,360 years would be 60 feet in one year. Prof. Wm. Thomson, of Edinburgh, says that the fall of meteorites necessary to keep alive the present supply of solar heat would amount to an increase in the sun's diameter of one mile in 88 years. This again would be 60 feet in one year. At this rate of increase we may learn in how long a time the sun would grow from a mere point to his present size; or, in other words, how long would be the duration of solar heat from the falling together of the present mass of the sun. Thus, when the sun had only one-half its present diameter, it had only one-eighth of its present volume and mass, and its force of gravity was only one-eighth of what it now is. Therefore eight times its present fall of materials would be necessary. Its surface was only one-fourth as large, and hence, on this latter account alone, the stratum of meteorites would be thickened four-fold. Hence, when the sun had one-half of his present diameter, the annual thickness of the stratum of meteorites would be $30 \times 8 \times 4 = 960$ feet. Here we have an arithmetical progression. For the first year or term the number is 30; for the last year or term the number is 960. The sum of all the terms is 220,500 miles $\times$ 5280 feet per mile $= 1{,}164{,}240{,}000$ feet. Now what is the number of terms or years necessary for this number of feet, the sum of all the terms? Let y be the number of terms. Then

$$\frac{30+960}{2} \times y = 1{,}164{,}240{,}000$$

$$y = 2{,}352{,}000 \text{ years.}$$

Hence, from this mode of calculating, the sun, from one-eighth of his present size, would grow to be what it now is in 2,352,000 years. This, however, is but an approximation. We have taken the force of gravity to be no stronger in proportion to its mass than on the present surface; whereas nearer its centre it would be stronger; and there would be 220,500 more miles to fall. But our approximation is near enough for our present purpose, and we come to the conclusion that the entire falling force of all the materials of the sun, when gravitating together, would supply the present rate of heat not more than 3,000,000 years.

III. In remarkable contrast to the last statement, we have the following from Prof. Herman L. F. Helmholtz, of Heidelberg: "Let us make this addition to our assumption: that, at the commencement, the density of the nebulous matter was a vanishing quantity, as compared with the present density of the sun and planets; we can then calculate how much work has been performed by the condensation; we can further calculate how much of this work still exists in the form of mechanical force, as attraction of the planets towards the sun, and as *vis viva* of their motion, and find by this how much of

the force has been converted into heat. The result of this calculation is that only about the 454th part of the original mechanical force remains as such, and that the remainder, converted into heat, would be sufficient to raise a mass of water equal to the sun and planets taken together, not less than 28,000,000 degrees of the centigrade scale. If the mass of our entire system were pure coal, by the combustion of the whole of it only the 3500th part of the above quantity would be generated." There is much ambiguity here in the words "remains" and "remainder." Prof. John Tyndall, of the Royal Institution, London, in his excellent work on "Heat as a Mode of Motion," takes both words to refer to the same thing. But really "remains" refers to the force still in store, as the attraction of the planets to the sun, and the *vis viva* of their motion. The "remainder" refers to the force of gravity already converted into heat during all past time. This past time has been so long that the burning of the solar system as pure coal would have furnished the heat for only the 3500th part of the time. But Mayer says that the burning of so much coal would last only 4600 years. Therefore $3500 \times 4600 = 16,100,000$ years for all past time, since the sun has been giving light and heat as he now does. Thomson says that a mass of carbon entering the sun, and burning with oxygen, would give out heat only equal to the 3000th part of its heat produced by the fall. Mayer says a meteorite, by its fall into the sun, develops from 4600 to 9200 times as much heat as would be generated by the burning of an equal mass of coal. If we take Mayer's lowest number, the most probable, the period would be $4600 \times 4600 = 21,160,000$ years. Thomson has given tables to show that the store of heat in the solar system, as the attraction of the bodies and as the *vis viva* of their motions, would last 45,723 years. Helmholtz says this is only the 454th part of the original store. Hence $45,723 \times 454 = 20,758,242$ years; a result remarkably near the above 21,160,000, and very far from the 3,000,000 years which I have attained from the data of Mayer and Thomson. The question now occurs, by what process of calculation has Helmholtz made the original falling force 454 times greater than what still remains, and that it would supply our heat for 21,160,000 years, instead of the approximation of 3,000,000 by my process above? I suppese he has done so by calculating the heat derived from the falling of a mass equal to the sun into another mass of the same amount; the gravity of the sun being not thereby increased, according to Mayer's theory! Mathematics have never been my leading study, and I have not the time for calculating the amount of heat to be developed in years by the falling of the materials of the sun from infinite space down to as near the centre of gravity as we now behold them. It would be an addition to science were some professed mathematician to publish this result by a method different from the one above by which I obtained the 3,000,000 years.

IV. The following statement of Helmholtz has been often quoted, and is still going around: "With regard to the store of chemical force in the sun, we can form no conjecture, and the store of heat existing therein can only be determined by very uncertain estimations. If, however, we adopt the very probable view that the remarkably small density of so large a body is caused by its high temperature, and that its density may become greater in time, it may be calculated that, if the diameter of the sun were diminished only the ten-thousandth part of its present length, by this act a sufficient quantity of heat would be generated to cover the total emission of 2100 years." Another form of the same statement has since been made, as follows: "If the sun be still contracting, the falling force thus brought into action would be sufficient to supply all the energy expended by the sun's radiations, if the contraction of the sun's diameter should only amount to one part in twenty millions in a year." This latter statement is derived from Helmholtz in this way: According to him, the surface of the sun must fall in all around towards the centre 110 feet every year to produce our present annual supply of heat. But 110 feet is the 21,000,000th part of the sun's radius. The entire statement seems

to me in very strange contrast with all the others we have just reviewed. It amounts to nearly this: If the sun should contract in volume from what it now is to half its present diameter, this falling of its surface less than a quarter of a million of miles would afford solar heat for ten millions of years. Whereas the falling of its surface, by contraction, through many thousand millions of miles, has produced heat enough for only double that period, according to Helmholtz, and for only 3,000,000 years, according to my calculation already made in this paper. To me this statement about a supply of heat for 10,000,000 years to come seems more erroneous by far than the one about heat for 20,000,000 years of the past by mere falling force. His processes for arriving at these conclusions are not given; until they are given, the mere assertions seem plainly contradicted by reliable data already reviewed.

After these statements of the mechanical theory of solar heat, we will now examine the objections to its various phases.

V. That phase of the mechanical theory which assumes that the heat of the sun proceeds from his own condensation by the force of gravity, is objectionable on account of the short supply of heat. It would be only twenty millions of years, according to the longest statement, which I think I have shown to be erroneous. That twenty millions of years are plainly due to the falling together of two masses, both equal to our sun. Three millions are nearer the truth, which is obtained by the rate of growth in the sun, according to the meteoric theory. But even twenty millions of years are nothing when compared with the vast lapse of time, or rather of eternity, that is past. The experiments of Bischof on basalt show that for our globe to cool down from 2000 degrees to 200 degrees centigrade, would require 350,000,000 years This result has been quoted and approved extensively by the highest authorities, among others by Helmholtz, and by Tyndall in his work on heat. Undoubtedly our globe was heated to a point as high as 2000° C. In "The Origin of the Stars" I have shown that the simple chemical elements composing our globe were created separately and uncombined, that they could not have combined slowly, but that they must have combined freely and rapidly, and in so doing our globe must have been all aflame, like the sun. Then for our earth to cool from 300° C. down so far as to be habitable for plants and animals, would require one hundred or two hundred millions of years more. Then come the long periods for the deposition of the fossiliferous strata; and these, the longer they are studied, seem to require longer and longer periods of time. This is my experience, after studying them forty years. Darwin computes, from data which seem sound, that 300,000,000 years have elapsed since the period of the weald, the latter part of the secondary. This latter part of the secondary, along with the tertiary, forms but a very small part of the stratified rocks. But we have been speaking only of the solid and the fused conditions of our planet. My many years of study on the nebulous condition of the great globes of space, impress me with nebulous periods equally as long and as incomprehensible as the fused and the solidified periods. In this way, while studying the monuments of the past set up by the Creator of the Universe for our guidance, our reason carries us back not only hundreds of millions, but thousands of millions of years, and, in endeavoring to conceive of these long periods, the mind is just as completely overburdened and bewildered as when we try to conceive of the immensity of space revealed by astronomy. By the side of all this how insignificant appears the three millions of years taken by the sun to give out his light by the mere falling force of his own materials. Even the twenty millions of years advocated by some appears no better. Therefore this phase of the mechanical theory of solar heat is untenable. Neither can it account for the former igneous fluidity of our globe. During the slow nebulous condensation the heat from that source must have slowly radiated away, and we must look to the chemical combination of its elements for its former fused condition.

VI. Mayer, the first originator of the meteoric theory of solar heat, calcu-

lated that the yearly accumulation of meteoric matter on the sun would so greatly increase the centripetal force of the solar system as to shorten our years from $\frac{3}{4}$ to $\frac{1}{4}$ of a second. This shortening of our years does not agree with our present astronomical observations. Moreover Laplace proved, from the observations of Hipparchus, that during the last 20 centuries our days have not been shortened by the one-three-hundredth part of a second. To escape this difficulty Mayer proposed the extraordinary idea that, by the undulatory theory, as well as by the old corpuscular theory of Newton, "the sun, like the ocean, is all the while receiving and losing equal quantities of matter." All the matter of the meteorites must be repelled back into space just as fast as they fall. But this is in direct contradiction to the theory of the conservation of force. The force imparted to the sun by the fall of meteorites might indeed repel them all back again precisely where they came from, providing there existed a condition of perfect elasticity. But this elastic rebound would completely exhaust all the force received by the fall, and no force could be left to be converted into light and heat. To make the sun give out light and heat with a force equivalent to the fall, and also to send back the meteors with a force equivalent to the fall, would be making the sun perform exactly double duty. Still another objection arises, equally as strong: It would be like saying that when a body burns, the products of combustion are radiated away in the forms of light and heat. But experiments in abundance have proved that chemical combinations lose none of their materials by light and heat. It would be hard to find a more clear or a more acute mind than that of Mayer, and yet, to save his grand and magnificent meteoric theory, he was led, no doubt reluctantly, to this idea of immense quantities of matter radiated away by the undulatory theory. We may say immense quantities, because the radiation of the sun would amount to his entire mass in 3,000,000 years; and a mass equal to the great globe on which we dwell in the lifetime of an aged man.

VII. Professor Wm. Thomson, of Edinburgh, endeavored to save the meteoric theory by a very different method. He supposed that meteorites are revolving around the sun within the earth's orbit, and that they appear to our vision in the zodiacal light. Being resisted by the solar atmosphere, they fall in the sun, and being already within our orbit their fall does not shorten our year. There are two objections to this phase of the meteoric theory. The first is that it does not allow time enough for geological facts. For the stability of the solar system, the meteorites must revolve around the sun in the same direction as the planets. They must come down spirally and hasten the rotation of the sun. Assuming that before their fall the sun did not rotate on its axis, then, to keep up the present emission of heat, the meteorites, according to Thomson, would give the present velocity to the sun in 32,000 years. Therefore sunlight has existed only during the past 32,000 years. Therefore the fossil plants away down in the lowest strata of our earth lived and flourished and were nourished by the light of the sun only 32,000 years ago! Sir Charles Lyell, in his Antiquity of Man, calculated that the bones and implements of men, found in what may truly be called superficial strata, are at least 100,000 years old, and in this I believe he is now supported by the assent of all geologists.

The second objection to Prof. Thomson's phase of the meteoric theory, is that it opposes not only the geological, but also the nebular theory. The nebular theory must no longer be regarded as a vague hypothesis, but as a scientific verity. In The Origin of the Stars, and in a paper in this volume of these Proceedings, I have proved mathematically that the velocities of all the members of the solar system, more than a hundred in all, are just such as they must have by the force of gravity acting according to the nebular theory; and that not only their various velocities, but the directions of their complicated motions, and the positions of their orbits, are just what the force of gravity would necessarily produce. I have given evidences equally as

strong that gravity imparted all their motions to all the stars in their orbits, as we have ever had that gravity now holds them in those very orbits. For these and many other reasons the nebular theory must be regarded as established. The supposition that the rotation of the sun has been caused by meteorites is directly opposed to the very foundation of the nebular theory, which teaches that the original rapid rotation of the sun by centrifugal force produced all the planets, planetoids, and also these very meteorites of the zodiacal light, if such there be. These meteorites must have had the same origin as the other members of the solar system, because they move in the same plane and in the same direction. Therefore these meteorites, if such there be, have derived their velocities from the sun, and not the sun from the meteorites. The wonder is, not that the sun now rotates so rapidly, but so slowly. When his surface extended to the orbit of Mercury his velocity of rotation was 110,000 miles per hour. Now it is only 4560 miles per hour. How has it been retarded? I have shown that in many, probably in most, cases the rotation of a nebula can be only on the surface, and that ultimately it must be retarded by friction on the unrotating interior. Between the orbit of Mercury and the present surface of the sun, the velocity of rotation must have been vastly increased in order to abandon any planetary or meteoric matter. But in reality the velocity was decreased, and therefore none could have been abandoned. Even before the abandonment of Mercury, there was a slackening of the rate of increase in solar rotation. It is on this account that the interplanetary space between Venus and Mercury is greater than that between the Earth and Venus, contrary to the law of all the other planets. For all the interplanetary spaces become less and less in approaching toward the sun, in consequence of the greater rate of nebular rotation. Therefore, in consequence of the slackened rate of rotation, we could look, according to the nebular theory, for no large mass of meteoric matter abandoned by the sun inside the orbit of the earth. But, for argument sake, let us suppose that a large amount of meteoric matter was thus abandoned, and let it be equal to the mass of Venus. This truly is a very liberal allowance. Then how long would its fall in the sun keep alive his present rate of heat? According to Thomson, the fall of Venus in the sun would prolong his heat just 83 years and 227 days. This is a wonderful contrast with the inconceivable millions of years demanded by the other facts of science

Mayer's phase of the meteoric theory is also opposed to the nebular theory. I suppose he must have seen that the present interior heat of the earth and its former entire igneous fusion could not be accounted for by the fall of meteorites, because they must have ceased gradually, and we would now find a thick crust of meteoric matter on the surface of our planet. He therefore supposes that the heat was caused by a collision with another large body. This collision must have produced not only the heat but also the rotation of the earth. The same must have occurred with the moon, because the lunar mountains and volcanoes exhibit unmistakeable evidences of former fusion and interior heat. The same also must have happened to the other planets and satellites, for they all rotate. Therefore, according to this view, each of the planets and satellites must have found a fellow to strike them, most wonderful to tell, precisely in the same way, and impart to them all their rotations in the same direction! But the solar system is constructed on different principles. There can be no collision of large planetary bodies; much less a very peculiar system of collisions to make them all rotate and move in their orbits exactly in the same way!

Thus we see insurmountable objections against all the three phases of the mechanical theory of solar heat. The old theory of luminous, calorific, cloud-like envelopes floating in the atmosphere of the sun, is very generally given up; but even this does not attempt to point out the cause of the heat in the supposed envelopes. There remains only the chemical theory, which has but the one objection, that there is not a sufficient amount of fuel in the sun.

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This objection I have shown, in The Origin of the Stars, to be founded on at least three groundless assumptions; founded, in fact, on our ignorance. It pretends to say that the materials of the sun, pound for pound, can give out no more heat than the materials of the earth. It pretends to say that the physical forces, all alive in the sun, can produce no more heat in connection with chemical combination than in our laboratories. It pretends to say that in the condensation of the sun no new chemical elements can be produced to serve as new fuel. It pretends all this in profound ignorance of what it ought to know for such assertions. On the contrary, I have shown various probabilities that the vastly different materials of the sun give out unspeakably more heat. I have shown various probabilities that all the physical forces alive together in the sun can produce more heat in connection with chemical combination than in our little laboratories. I have shown, what seems to me conclusive proofs, that new chemical elements are now forming in the sun to serve as new fuel. These probabilities I do not call my demonstration. But beyond all this I have given, as my special demonstration, large numbers of facts and arguments, derived from the earth, the sun and the fixed stars, to prove that solar heat springs from chemical action. Until some one in the scientific world attempts to answer my facts and arguments, I need say nothing further.

There are many other objections to the mechanical theory, but I think quite enough have here been given to put the discussion at rest forever.

Descriptions of Five New Species of Central American BIRDS.

BY GEO. N. LAWRENCE.

1. GLAUCIS ÆNEUS.

Front and top of the head dull brown, upper plumage besides of a shining coppery bronze, the upper tail coverts are rather more bronzy, with dull grayish margins; the two central tail feathers are of a dull pale bronzy green, the other tail feathers are chestnut at base, with a broad subterminal band of black, all of them end in white; ear coverts black; a pale rufous stripe runs from the bill under the eye, and there is a postocular mark or streak of the same color; a dusky line extends from the under mandible down each side of the neck; the entire under plumage and under tail coverts are of a clear rufous; upper mandible black, the under is dull yellow for two-thirds its length, with the end black; feet pale yellow.

Length (skin) 4½ in.; wing 2 1-16th; tail 1¼; bill 1¼.

Habitat.—Costa Rica. Collected by A. R. Endrés. Type in Museum of Smithsonian Institution.

Remarks.—This species differs from *G. hirsuta* and its allies in the bronzy coloring of its upper plumage, and also in being smaller; in the well marked band on the tail feathers it is much like *G. affinis*, but the color of the band is of a deeper black, not bluish black; the tail feathers are narrower than in *affinis*, and the under tail coverts more rufous.

Several specimens examined vary only in some having their upper plumage more of a golden bronze, others being more coppery: none have the under mandible of a clear yellow, some scarcely showing that color, the bill appearing to be entirely black.

2. EUPHERUSA NIGRIVENTRIS.

Fore part of the head as far as upon a line with the back part of the eyes, and the entire under surface deep velvety black; occiput dull ashy brown, upper plumage grass green tinged with golden; upper tail coverts of a dull coppery bronze; the four central tail feathers blackish purple, the three lateral on each side pure white; primaries brownish purple; the wing coverts green like the back; the secondaries are chestnut at the base with their ends

purple; sides under the wings dull green; the vent and under tail coverts white; bill black; feet yellowish.

Length (skin) 3¾ in.; wing 2; tail 1¼; bill ⅝.

Habitat.—Costa Rica. Collected by A. R. Endrés.

Type in Museum of Smithsonian Institution.

Remarks.—The combination of colors in this bird is of an unusual character, and I know of none which it at all resembles. I consider it strictly congeneric with the species heretofore placed by me in *Eupherusa*, viz., my *E. cupreiceps* and *Thaumatias chionurus* of Mr. Gould. In the present species the character of the secondaries being chestnut, I think strengthen its claims to an alliance with *E. eximia*.

3. THAUMATIAS LUCIÆ.

Upper plumage of a dull bronzy dark green, the crown duller; the upper tail coverts of a lighter bronzy green, somewnat golden; the tail feathers are dull bronzy green, all except the two central ones are broadly marked near their ends with dark purplish bronze, the tips being ashy gray; the throat and breast are glittering bluish green, middle of the abdomen white; the under tail coverts are light olive margined with white; wings brownish purple; upper mandible black, the under yellow with the end blackish; feet black.

Length (skin) 3¾ in.; wing 2⅛; tail 1⅜; bill 13 16ths.

Habitat.—Honduras.

Remarks.—In size and colors of the body this species is much like *T. Linnæi*, but the tail is quite different, and closely resembles, in the coloring of its under surface, that of *T. chionopectus*.

This was the only specimen in the collection from which I obtained it, but there were many specimens of *T. candidus*.

This species is dedicated to Miss Lucy Brewer, daughter of my friend Dr. Thomas M. Brewer, of Boston.

4. DROMOCOCCYX RUFIGULARIS.

Head above and entire upper plumage rich dark brown of a purplish lustre; the tips of the feathers on the head, back and wing coverts are sparingly marked with minute spots of pale rufous, some of the larger coverts are more rufous at their ends, the color extending for some distance along the shafts; the upper tail coverts, which are much lengthened, are of a duller brown than the back, they have a greenish gloss, and are margined with dull gray; the tail feathers are much the same in color as the back, and are narrowly edged on both webs with very pale rufous; the tail underneath is of a clear grayish ash, with the shafts of the feathers white, and the edges of the feathers narrowly marked with whitish; quill feathers brown, with their shafts white underneath, and the inner webs marked with white at the base; a postocular stripe of light rufous extends to the hind neck; ear coverts dark brown; sides of the neck, throat and upper part of the breast rufous, paler on the throat and deeper in color on the breast, on the latter some of the feathers have their edges narrowly marked with black; the color of the breast connects with the rufous stripe running back from the eye; the remaining under parts with the under tail coverts, white; the greater part of the upper mandible is black, the edges together with the under mandible being yellow; tarsi and toes brown, soles of the feet yellow.

Length (skin) 10½ in.; wing 6; tail 6½; tarsi 1⅛; bill ⅝.

Habitat.—Guatemala. Obtained from Dr. C. H. Van Patten, who had no knowledge concerning it, except that it came from a high mountain region.

Remarks.—This species is much smaller and of a more delicate form than *D. phasianellus*, Max. (*D. mexicanus*, Bp.), and is quite different in coloration, that having the crown and crest dark cinnamon, the wing coverts conspicuously edged with whitish, the postocular stripe nearly white and the throat and upper breast spotted and streaked with black; the feet in the new species are much weaker.

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5. ARAMIDES ALBIVENTRIS.

Occiput and part of hind neck brownish cinnamon; chin and throat whitish; fore part of the head and crown, with the neck behind and in front of a clear bluish gray; back and wings greenish olive; rump, tail, flanks, abdomen and under tail coverts black; thighs smoky black; quills bright reddish cinnamon; under wing coverts dull pale cinnamon, with blackish bars; breast pale cinnamon, this color extending round partly on the back; the elongated feathers of the breast, which extend down the sides of the abdomen are white, and form a conspicuous broad mark in shape of the letter U inverted, which contrasts strikingly with the reddish and black colors above and below it; the bill is orange as far as the nostrils and pale greenish yellow at the end; the legs appear to have been light vermillion.

Length about 21 in.; wing 7½; tail 2½; bare part of tibia 1; tarsi 3; bill 2¼.

Habitat.—British Honduras.

Remarks.—I have had the above described specimen for some time, and considered it to be a new species, but delayed publishing it. I have recently obtained another precisely like it, that came from Guatemala.

It differs from *A. Cayennensis*, Gm., in the breast being of a pale instead of a deep cinnamon red, and in having the white mark on the abdomen.

Additional Note on the "CHINCH-BUG."

BY HENRY SHIMER, M. D.

The "Chinch-bug" has entirely disappeared from this region, so far as I have been able to observe. I have made diligent search since spring, with the object of obtaining a few living specimens, but up to this time have not succeeded in finding a single specimen. I am convinced that the efficient cause of their entire destruction exists in the continuation of the epidemic among them. Their overthrow is a cause of great rejoicing among the farmers. And once more, as of yore, they have realized a bountiful wheat harvest. I have but one thing to regret in their annihilation; I neglected to obtain a good supply of specimens, while they might have been secured by the wagon load.

Mt. Carroll, Ill., Sept. 16, 1867.

Prof. Cope gave an account of the extinct reptiles which approached the birds. He said that this approximation appeared to be at two points. The first by the Pterosauria, to which the modified bird Archaeopteryx presented points of affinity. The second, and one not less striking, is by the Dinosauria of the orders Goniopoda and Symphypoda. He showed the essential differences between the ordinary Dinosauria and the birds to consist in the distinct tarsal bones in two series, the anteriorly directed pubes, and the presence of teeth, of the first class. In the genus Lælaps Cope, type of the Goniopoda, the proximal series of tarsal bones was principally represented by one large astragaloid piece which had a very extensive motion on those of the second series. This was immovably bound to, and embraced, the tibia, and was perhaps continuous with the fibula, much resembling the structure of the foot of the chick of the ninth day, as given by Gegenbaur. The zygomatic arch was of a very light description. He was convinced that the most bird-like of the tracks of the Connecticut sandstone were made by a nearly allied genus, the Bathygnathus Leidy. These creatures, no doubt, assumed a more or less erect position, and the weight of the viscera, etc., was supported by the slender and dense pubic bones, which were to some extent analogous to the marsupial bones of Implacental Mammalia, though probably not homologous with them.

He said he was satisfied that the so-called clavicles of Iguanodon and other Dinosauria were pubes, having a position similar to those of the Crocodilia.

Also that a species of Lælaps had been observed in France, by Cuvier, which was different from the L. aquilunguis, and which he proposed should be called Lælaps gallicus.

Compsognathus Wagner, type of the Symphypoda, expressed the characters of the latter in the entire union of the tibia and fibula with the first series of tarsal bones, a feature formerly supposed to belong to the class Aves alone, until pointed out by Gegenbaur. This genus also offered an approach to the birds in the transverse direction of the pubes, (unless this be due to distortion in the specimen figured by Wagner,) their position being intermediate between the position in most reptiles and in birds. Other bird-like features were the great number and elongation of the vertebræ of the neck, and the very light construction of the arches and other bones of the head.

He thought the penguin, with its separated metatarsals, formed an approach on the side of the birds, but whether the closest approximation to the Symphypoda should be looked for here or among the long-tailed Ratitæ (ostrich, etc.,) he was unable to indicate.

The following reports of the Curators, Librarian and Recording Secretary were read :

REPORT OF THE CURATORS.

The Curators, in the presentation of their usual Annual Report, take pleasure in announcing to the members of the Academy that its Museum is throughout in a fair state of preservation, and during the last year has continued to increase, through the interest and liberality of the lovers of natural history. Through the same qualities we have been provided with a large amount of means, upwards of $100,000, towards the purchase of ground and the erection of a more capacious building to accommodate the Museum. However, even after sufficient means are procured for the completion of this object, it is not enough for the interests of the Academy and Science that we should stop here. The Museum has now acquired such giant proportions that voluntary labor can no longer be depended upon for the arrangement of the cabinet; indeed, the Museum in its present unarranged and often confused condition, loses the greater part of its value to students. The time has arrived when it is highly important that means should be obtained to employ a Curator and competent assistants whose duty it shall be to classify, arrange, and label the collection and maintain it in perfect order.

The Museum of the Academy has become one of the most attractive places of visit in our city, and with its collections properly arranged and labelled will become a great school of popular instruction. During the past year, though open only, as usual, two half days weekly, it was visited by 51,520 persons.

If our city government appreciated the importance of the Academy as a school of instruction to the people, it could not hesitate to aid it in its object, by appropriating for its use, as has been repeatedly suggested, one of the public squares at Broad and Market Streets.

The following account exhibits the contributions to the Museum in its various departments during the year.

Mammals.—Fifteen specimens were presented by Dr. J. H. Slack, Dr. H. B. Butcher, U. S. A., S. Powel, Rev. Alden Grant, Mr. Reeves, Joseph E. Shaw, G. J. Durham, O. Biddle, W. S. Vaux, and E. D. Cope.

Birds.—One hundred and ninety-one from Alaska and Hudson Bay Territory, were presented by the Smithsonian Institution; 67 from Texas, by Dr. H. B. Butcher, U. S. A., and 43 species of birds, nests and eggs, were presented by Dr. William Zaremba, Dr. V. B. Hubbard, U. S. A., Rev. Alden

Grout, Dr. George Smith, Mrs. Horace Fassitt, Capt. Thomas Clarkson, Mr. G. J. Durham, and Mr. W. S. Vaux.

Reptiles.—At different times Prof. E. D. Cope presented collections comprising together many species; and other collections were presented by Dr. George H. Horn, Mr. W. S. Vaux and Prof. M. Miles. Seven species were presented by Capt. R. B. Ely, Rev. E. R. Beadle, Mr. Robert Swift, Dr. C. W. Zaremba and Dr. E. J. Lewis.

Fishes.—Many species, fresh water and marine, were presented at different times by Prof. E. D. Cope, and a small collection from Surinam was presented by the Smithsonian Institution. Seven species were presented by Dr. G. H. Horn, Mr. E. Homan, Col. W. H. Yeaton, Dr. S. Ashhurst, Dr. Slack and Mr. J. D. Sergeant.

Mollusks.—Above all other departments of the Museum of the Academy, the conchological cabinet has been greatly enriched the past year. Mr. George W. Tryon, Jr., has deposited his collection of upwards 10,000 species, in addition to 100 jars of alcoholic specimens, mainly naked mollusks. Through this extensive addition the conchological collection of the Academy has become one of the largest in the world. Through the activity of the Conchological section of the Academy during the year, our cabinet has also received many available additions, for the details of which we refer to the report of the Conservator of that Section.

Articulates.—Small collections of crustacea, and a few specimens of insects, &c., were presented by Capt. Ely, Wm. M. Gabb, J. R. Thompson, E. R. Beadle, F. Guckert, Dr G. R. McCoy, and R. Frazer.

Radiates.—Small collections were received from Robert Swift and W. M. Gabb, and specimens were presented by A. Black, A. C. Kline, J. Cassin, J. Harrod, and S. Powel.

Fossils.—Prof. E. D. Cope presented a valuable collection of remains of an extinct whale, Eschrichtius cephalus, a Basilosaurus, B. atlanticus, a new B. mento, and a number of rays, from the miocene formation of Maryland. Drs. Francis and Samuel Ashhurst also presented several collections comprising many fragments of bones of saurians, chelonians, and fishes, from the green sand of New Jersey. Dr. LeConte presented collections of remains of fishes, shells, and plants from the cretaceous and other formations of Kansas and New Mexico. Mr. William Brown, through William M. Gabb, presented a fine specimen consisting of the greater part of the skull of the great extinct Bison antiquus, from San Francisco, Cal., and Dr. Geo. H. Horn presented remains of an extinct horse, from California. Small collections of fossils and specimens were also presented by T. A. Conrad, Dr. S. B. Howell, Dr. N. M. Glatfelder, Dr. I. Hays, James W. Carson, W. H. Stevens, J. Krider, W. S. Vaux, P. W. Sheafer, Dr. G. W. Hall, and Charles E. Smith.

Minerals.—Fifty-nine specimens were presented by I. Lea, W. S. Vaux, S. F. Peck, Rev. E. R. Beadle, W. H. Boyer, the Resolute Mining Co., B. A. Hoopes, Dr. J. L. LeConte, Dr. W. S. W. Ruschenberger, Wm. L. Mactier, Joseph Harrod, A. R. Leeds, A. C. Kline, Dr. G. Lincecum and E. J. Houdon.

Botany.—A collection of Australian plants was presented by Prof. Asa Gray, and collections of plants were presented by the Rev. Mr. Reeve and by Mrs. Carolina A. Hiester. Miscellaneous botanical specimens were presented by E. D. Kennedy, A. D. Jessup, Wm. M. Gabb, Joseph Harrod, T. Meehan and Miss Helen Blythe.

Comparative Anatomy.—Wm. M. Gabb presented eight skulls of California Indians, besides two other skulls. Fifteen skulls of mammals were presented by R. Swift, E. D. Cope and W. S. Vaux; and six miscellaneous anatomical specimens were presented by R. Swift, L. H. Deal, W. Taggart, and S. B. Howell.

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Miscellaneous.—Dr. G. Lincecum presented 36 jars of zoological specimens rom Texas; Mr. Cope presented a collection of Indian relics; and an antique opper hammer from Lake Superior was presented by S. F. Peck. Miscellaeous specimens were presented by Jos. M. Valdespino, Dr. Shippen, J. R. hompson, F. Dick, Dr. John C. Spear, U. S. A., F. Coxe, J. G. McClenahan, . Cassin, H. Allen and S. B. Howell.

Respectfully submitted by

JOSEPH LEIDY,

Chairman of the Curators.

REPORT OF THE LIBRARIAN.

The Librarian most respectfully reports that the number of donations to the ibrary from January to December, 1867, inclusive, is 1681.

Of these there were volumes	380
pamphlets	1295
maps	6
Total	1681

As follows:

Folios	28
Quartos	418
Octavos	1207
Duodecimos	22
Maps	6
Total	1681

These were derived from the following sources:

		And were divided as follows:	
Editors	157	Anatomy and Physiology	13
Authors	209	Bibliography	14
Societies	629	Botany	39
Library Fund	201	Chemistry	1
Wilson Fund	160	Conchology	328
Geo. W. Tryon, Jr	208	Entomology	45
Publishers	8	General Natural History	53
Minister of Public Works, France	7	Geology	103
Dr. Jos. Leidy	4	Helminthology	6
J. S. Haldeman	17	Herpetology	4
T. Gwyn Jeffreys	14	Ichthyology	8
A. & H. Adams	38	Journals	959
Hon. Secretary of the Navy	1	Languages	3
Wm. S. Vaux	1	Mammalogy	5
Treasury Department	7	Medicine	19
U. S. Coast Survey	1	Mineralogy	14
Smithsonian Institution	6	Ornithology	33
Geological Survey of India	7	Physical Science	21
Hon. Leonard Myers	1	Useful Arts	1
Hon. Chas. Sumner	1	Voyages and Travels	12
Mrs. Lucy W. Say	1		
Chas. E. Smith	1		
Surgeon General U. S. A	2	Total	1681
Total	1681		

One hundred and sixty volumes and two hundred and thirty three pamphets were presented through the Conchological Section of the Academy.

All of which is respectfully submitted. J. D. SERGEANT.

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REPORT OF THE RECORDING SECRETARY.

During the year ending November 30th, 1867, there have been elected one hundred and eleven members and sixty-six correspondents.

The death of the following members and correspondents have been announced:

Ten members—namely: Mr. Edward F. Sanderson, Mr. Robett Kennicott, Mr. William Norris, Prof. Alex. D. Bache, Washington Sherman, M. D., C. W. Pennock, M. D., Mr. Samuel C. Morton, Miss Margaretta H. Morris, Mr. Jacob Pierce, Mr. Richard M. Marshall;

Nine correspondents—namely: Rev. Stephen Elliott, Geo. W. Featherstonhaugh, Dr. Brackenridge Clemens, Prince Maximilian Zu Wied, Dr. Geo. Jager, Dr. C. M. Diesing, Prof. Farraday, Dr. Zimmerman, Rev. Dr. C. Dewey.

Three members have resigned.

The number of papers contributed and ordered to be printed in the Proceedings and Journal during the year has been thirty-six, as follows:

In the Proceedings thirty-three; namely—

Aubrey H. Smith	1	G. C. Lincecum, M.D.	1
Thomas Meehan	4	J. H. Slack, M.D	1
E. D. Cope	5	H. C. Wood, Jr., M.D	2
Isaac Lea	2	John Cassin	4
Henry Shimer, M.D.	2	Alphonso Wood	1
Jacob Ennis	1	Geo. N. Lawrence	1
D. G. Elliott	1	Elliott Coues, M.D.	1
Richard Hill	1	John L. Le Conte, M.D.	4
Geo. H. Horn, M.D	2		

In the Journal three; namely—

E. D. Cope 3

All of which is respectfully submitted.

S. B. Howell, Recording Secretary.

The following reports were read from the Conchological Section:

REPORTS OF THE CONCHOLOGICAL SECTION.

REPORT OF THE SECRETARY.

The Conchological Section of the Academy of Natural Sciences would beg leave to report—

That the Section was organized by the election of officers, Dec. 6th, 1866. Six members and seventy-three correspondents have been elected during the year. Two members have resigned, and one correspondent has died. Meetings have been regularly held on the evening of the first Thursday of each month. Correspondence has been opened with scientific gentlemen in this country and abroad, as will be seen by the Secretary's report.

A number of articles on scientific subjects have been published, as well as consecutive numbers of the "American Journal of Conchology," and the "Monograph of Terrestrial Mollusca."

Donations to the library have been numerous, as noticed in report of the Librarian.

Additions to the collection during the year have been beyond all precedent in the number and value of specimens, as may be seen by the Conservator's report.

In conclusion, we venture to express the hope that, under the fostering care of the Academy, this Section may prove an efficient arm of the service, in carrying on the work which this noble institution is destined to accomplish for true science and the diffusion of knowledge.

R. R. Bradle, Secretary.

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REPORT OF THE CORRESPONDING SECRETARY.

s have been addressed to the following gentlemen, announcing their as correspondents:

uis Agassiz, Cambridge, Mass.
Anthony, Cambridge, Mass.
nch Angas, Australia.
dams, London.
Adams, London.
and, New York.
on, Cheltenham, England.
urguignat, Paris.
ust Baudon, Bauvais, France.
noit, Messina, Sicily.
E. Chittenden, New York.
. Carpenter, Montreal, C. W.
?. Cavada, Tr. de Cuba.
rosse, Paris.
. Chenu, Paris.
ward Chitty, Jamaica.
Calliaud, Nantes, France.
. Cooper, San Francisco.
. Cox, N. S. W.
. Deshayes, Paris.
m. Dunker, Marburg, Hesse.
H. De Camp, M. D., Grand
s, Mich.
rouet, Troyes, France.
l Fischer, Paris.
eo. Gill, Washington, D. C.
Gabb, San Francisco.
E. Gray, London.
ssies, Bordeaux, France.
undlach, Havana, Cuba.
nes Hall, Albany, N. Y.
S. Holmes, Charleston, S. C.
Hyatt, Salem, Mass.
r Hanley, Middlesex, Eng.
les Hidalgo, Madrid, Spain.
, M.D., Rye, N. Y.
Jeffryes, London.
rtland, M.D., Cleveland, O.
k Krauss, Stuttgard.
Dr. H. C. Küster, Cassel.
James Lewis, M.D., Mohawk, N.Y.
Prof. Albert Mousson, Zurich, Sw.
Edward F. Morse, Salem, Mass.
Prof. F. B. Meek, Washington, D. C.
R. P. Montrouzier, New Caledonia.
Arthur Morelet, Dijon, France.
Prof. O. A. L. Mörch, Copenhagen.
Jules Mabille, Dinan, France.
Wesley Newcomb, M. D., Oakland, California.
Temple Prime, New York.
Patricio Maria Paz, Madrid, Spain.
Dr. Louis Pfeiffer, Cassel.
Prof. F. Poey, Havana, Cuba.
Baron de Castello de Paiva, Lisbon.
Dr. R. A. Philippi, Santiago, Cuba.
M. C. Recluz, Paris.
Wm. D. Stimpson, M.D., Chicago.
E. R. Showalter, M. D., Uniontown, Alabama.
Prof. G. B. Sowerby, London.
Prof. D. S. Sheldon, Davenport, Iowa.
Petit de la Saussaye, Paris.
R. E. C. Stearns, San Francisco.
Abbe Joseph Stabille, Milan.
M. Souverbie, Bordeaux, France.
J. H. Thompson, New Bedford, Mass.
Prof. F. H. Troschell, Bonn, Prussia.
A. P. Turver, Lyons, France.
Professor George Ritter von Fraunfeld, Vienna.
Prof. P. J. Van Beneden, Bruxelles, B.
Prof. Van Mohrenstein, Vienna.
Dr. Levi Vaillant, Paris.
Prof. Van den Busch, Bremen.
J. R. Willis, Halifax.
Alex. Winchell, Ann Arbor, Mich.

s have also been written to the following gentlemen:

22*d*, 1867.—W. T. Blanford, Calcutta, proposing an exchange of pub-
s and specimens;
aladilhe, Montpelier, France;
Mabille, Paris; proposing exchanges.
th.—D. Rafael Arango, Cuba, proposing an exchange of specimens.
11*th*.—Hon. L. E. Chittenden, New York, accepting proposals to send

19*th*.—Sylvester Hanley, accepting proposals for an exchange;
Blandford, Calcutta, accepting proposals for an exchange.

s have been received from the following gentlemen, accepting of their as correspondents:
th.—D. S. Sheldon, Davenport, Iowa.

May 11*th*.—James Lewis, M. D., Mohawk, N. Y.; Wm. Stimpson, M. D., Chicago.
May 15*th*.—E. R. Showalter, M.D., Alabama.
May 18*th*.—J. G. Anthony, Cambridge, Mass.
May 23*d*.—Temple Prime, New York.
May 29*th*.—J. C. Jay, M.D., Rye, N. Y.; F. C. Morse, Salem, Mass.
June 1*st*.—Thomas Bland, New York.
June 28*th*.—Alexander Winchell, Michigan.
July 12*th*.—Prof. Theodore Gill, Washington, D. C.
July 31*st*.—Col. F. F. Cavada, Cuba.
Aug. 12*th*.—Prof. F. B. Meek, Washington, D. C.

Letters have been received from the following gentlemen, offering to send shells or exchange specimens:

1867. *Sept*. 4*th*.—Hon. L. E. Chittenden, New York; Sylvester Hanley, Middlesex, England.
Sept. 5*th*.—Prof. J. E. Gray, British Museum; W. T. Blanford, Calcutta.

All of which is respectfully submitted. R. R. Beadle,
Dec. 5, 1867. Corres. Sec'y.

REPORT OF THE CONSERVATOR.

The Conservator of the Conchological Section respectfully reports that the Conchological cabinet has been increased during the year by the following donations and purchases:

Geo. W. Tryon, Jr., presented six specimens of shells exhibiting internal structure; Magilis antiquus from the Red Sea; Helix Parkerii; ninety-five species selected from the Poulson Collection, and about two hundred additional duplicate species from the same collection; four specimens of Cephalopods, in spirits, and forty-eight species, numerous specimens of Australian shells, together with a collection of Cephalopods and other naked mollusks in spirits.

One hundred and eighty-four species of marine shells from Italy were received from Sylvanus Hanley; one hundred and fifty-six species, three thousand nine hundred specimens of Unionidæ and Melania chiefly from Alabama, from E. R. Showalter, M.D.; types of sixty-four species of Polynesian shells, described by W. H. Pease, were received from their describer. One hundred and six species, numerous specimens of shells from Canary Islands, Greenland, Arabia and Chili were presented by O. A. L. Mörch.

S. S. Haldeman presented his type specimens of the genera Limnea, Planorbis and Physa.

One hundred and four species of American terrestrial and fluviatile shells were received from E. Hall; one hundred and twenty-two species, numerous specimens of Polynesian shells from Dr. J. C. Cox; ninety-one species of shells from Australia, South America, Palestine, &c., from W. P. Wilstach. One hundred and forty species, numerous specimens of land and fresh-water shells, were presented by Aug. Brot, M.D., of Geneva.

Rev. E. R. Beadle presented a specimen of Navea Newcombii, a perforating Haliotus, from Lower California, three species of Cuban shells, and two specimens of Pinna squamosa, from the Mediterranean Sea, Mactra lateralis, Say, Voluta Turneri, a large collection of Solens, Mactræ, &c., and five species of terrestrial shells from Syria and Java.

Thirty-one species, numerous specimens of Cuban land shells were received from Col. F. F. Cavada.

Collections were also presented by G. A. Lathrop, A. O. Currier, J. R. Willis, C. F. Parker, F. H. Aldrich, Wm. M. Gabb, Dr. Jos. Leidy, F. A. Randall, E. D. Cope, John Ford and Andrew J. Bennett.

Sixty-three species, numerous specimens, were received from Dr. E. W.

[Dec.

Hubbard, John Krider, J. E. Eshleman, S. R. Roberts, Dr. H. C. Wood, Jr., Isaac Lea, Geo. Scarborough, W. D. Hartman, M.D., Geo. H. Horn, M.D., John Cassin, Thos. Bland, Wesley Newcomb, Wm. S. Vaux, R. E. C. Stearns, Miss Anna Abbott, J. L. Julius, J. H. Redfield, Dr. James Lewis, and Jacob Ennis.

Types of Rafinesque's Unios, with the original labels in his handwriting, were obtained by purchase from the collection of the late Chas. A. Poulson.

In addition to the above, the magnificent collection of over one hundred thousand specimens of ten thousand species, deposited by Mr. Geo. W. Tryon, Jr., has been received and incorporated with the main collection, making our cabinet richer than any other in the world in specimens, and the richest in species with one exception, that of the British Museum.

A collection of one hundred and eight species of American shells has been sent to Dr. J. C. Cox, of Sydney, Australia, in exchange for Polynesian shells, received from him. A similar collection has been sent to M. Luigi Benoit, of Sicily, and a smaller one to M. Spiridione Brusina.

The various collections received during the year have been arranged, labelled and deposited in their proper places in the cabinet by Messrs. Geo. W. Tryon, Jr., Chas. F. Parker, S. R. Boberts and others, who have devoted much time and labor to the work. The proper systematic arrangement has been somewhat interfered with in consequence of the very limited accommodation afforded our magnificent collection in our present building, nor can any remedy for this inconvenience be at present suggested.

Dr. S. B. Howell has kindly undertaken the arrangement of our alcoholic collection, and has made considerable progress therein.

Opportunity having offered to acquire a portion of the collection of shells belonging to the late Hugh Cuming, of London, which portion consists of about one thousand species not yet in our museum, a subscription list was opened, and our appeal having been answered encouragingly, the shells were ordered, and some of them are now on their way to the Academy.

Although the Conchological Section of the Academy has been in existence but little over a year, yet an observation of its present condition cannot, we believe, fail to be gratifying to all interested in the science for the encouragement of which it was instituted. Whilst the augmentation of the collection during that time has been beyond all precedent, a reference to the list of our contributors will prove that the interest taken in the department is not confined to our members alone, but is manifested by others who are not so intimately connected with us, both at home and abroad.

In conclusion, we beg leave to congratulate those present that through their instrumentality, the interest heretofore manifested in our science has been greatly increased, and to hope that their efforts may be still farther successful in the future in gaining for Conchology that prominent position among the Natural Sciences which it so well deserves.

Respectfully submitted by

JOSEPH LEIDY, *Conservator.*

LIBRARIAN'S REPORT.

There have been presented during the past year to the Conchological Section of the Academy of Natural Sciences, 140 volumes, and 298 periodicals, Pamphlets, &c. Of these works, 195 are from Authors, 12 from Editors, 14 from Societies, 12 from Smithsonian Institution, 5 from Publication Committee of Conchological Section of the Academy of Natural Sciences, and 140 bound volumes, and 60 pamphlets, &c., from G. W. Tryon, Jr.

In addition to the above there have been presented to the Academy of Natural Sciences, 21 volumes, pamphlets, &c., on Conchological subjects.

Respectfully submitted.

C. F. PARKER,
Librarian.

The election of officers for the ensuing year was held in accordance with the By-Laws, with the following result:

President	Isaac Hays, M.D.
Vice-Presidents	Wm. S. Vaux, John Cassin.
Corresponding Secretary	Harrison Allen, M.D.
Recording Secretary	Samuel B. Howell, M.D.
Treasurer	Wm. C. Henszey.
Librarian	Edward J. Nolan, M.D.
Curators	Jos. Leidy M.D. Wm. S. Vaux, John Cassin, Edw. D. Cope.
Auditors	Jos. Jeanes, Wm. S. Vaux, Aubrey H. Smith.
Publication Committee	Jos. Leidy, M.D., Wm. S. Vaux, Robert Bridges, M.D. John Cassin, Geo. W. Tryon, Jr.

The following were elected members:

J. Ronaldson Magee, Horace Magee, Isaac S. Waterman, A. J. Antelo, Wm. G. Moorhead, Richard K. Betts, George W. Brown, M.D., Henry R. Silliman, M.D., U.S.A., Edwin Sheppard, Jos. Willcox and Josiah W. Leeds.

ELECTIONS FOR 1867.

The following persons were elected Members—viz.:

Jan. 29.—J. E. Farnum, W. H. Stevens, Edw. B. Edwards, Jas. Levick, M.D., Chas. Gibbons, John B. Austin, Wm. S. Baird, Edwin Greble, Walter B. Smith, Wilson M. Jenkins, C. J. Haseltine.

Feb. 26.—Evans Randolph, Francis R. Cope, Joseph Patterson. Richard M. Marshall, Benjamin Marshall. John Livezey, Chas. H. Borie, Thos. P. Cope, Miss R. A. Cope, Mrs. E. H. Vaux, Jos. S. Lovering, Jr., Saml. P. Carpenter, Richard R. Robb, Wm. Hacker, Stephen Colwell, Miss Ann Haines, Miss Jane R. Haines, F. L. Bodine, Horace M. Bellows, M. D., John G. Stetler, M. D., Wm. Procter, Jr., Anthony Heger, M.D., U.S.A.

March 26.—Samuel Ashhurst, M.D., Francis Ashhurst, M.D., Rev. J. L. Beman, Chas. Smith, Thomas Earp, Charles Taylor, Moro Phillips, Samuel Welsh, Lewis Cooper, Benj. B. Comegys, S. C. Morton, Mrs. E. P. Long, Miss Bohlen.

April 30.—Wm. Hay, Jas. H. Little, Beaveau Borie, J. Ross Snowden, Wm. W. Keen, Jr., M.D., Edw. J. Nolan, M.D., Chas. Magarge, Chas. S. Coxe, I. V. Williamson, Matthew Baird, Chas. Wheeler, Robert H. Gratz, Adolph E. Borie, H. Pratt McKean, George F. Tyler, Wistar Morris, Jos. E. Page, Israel Morris, A. Campbell, Thos. A. Scott, H. H. Houston, Chas. Spencer, Gustavus S. Benson, Wm. A. Blanchard.

May 28.—Asa Whitney, Geo. Whitney, Jno. R. Whitney, E. W. Clark, Clarence H. Clark, Frank H. Clark, Theo. H. Morris, O. N. Beach, Jas. N. Whelen, Wm. A. Whelen, Alexander Whilldin, Orlando Crease, Andrew I. Sloan, D. Murray Cheston, M.D., Edw. C. Knight, C. P. Bayard, Jay Cooke, A. J. Drexel, Jas. A. Wright, John T. Taitt, Jr., John Baird, Thos. Clyde. John B. Trevor, Thomas Potter, Frank Haseltine, Clarence S. Bement, Danl. H. Rockhill, Franklin S. Wilson, Rev. J. C. Ralston, Wm. R. White.

June 25.—S. Morris Waln, B. Hammit.

July 30.—Henry C. Gibson, Andrew M. Moore, John Gibson, T. Brantly Langdon.

Aug. 27.—James K. Tyson, M.D., Wm. Pepper, M.D., Geo. Pepper, M.D, Horace Binney Hare, M.D, Elias D. Kennedy.

Sept. 24.—A. G. Hinkle, M.D., Chas. H. Thomas, M.D.

Oct. 29.—Chas. W. Matthews.

Nov. 26.—Edw. R. Murphy, Lloyd P. Smith, F. A. Hassler, M.D., G. Y. Shoemaker, Matthew Newkirk.

Dec. 31.—J. Ronaldson Magee, Horace Magee, Isaac S. Waterman, A. J. Antelo, Wm. G. Moorhead, Richard K. Betts, Geo W. Brown, M.D., Henry R. Silliman, M.D., U.S.A., Edwin Sheppard, Jos. Willcox, Josiah W. Leeds.

The following were elected Correspondents—viz.:

Jan. 25.—Prof. O. C. Marsh, of New Haven, Conn.; Prof. Wm. H. Brewer, of New Haven, Conn.

March 26.—John R. Willis, of Halifax, N. S.; Gideon Lincecum, of Long Point, Texas; Samuel H. Scudder, M.D., of Boston; Hon. Geo. P. Marsh, of Florence, Italy.

April 30.—Col. Frederick F. Cavada, U. S. Consul at Trinidad de Cuba; Eugene Gaussoin, Ph.D., of Baltimore, Md.; Alpheus Hyatt, of Salem, Mass.; F. W. Putnam, of Salem, Mass.

May 28.—E. E. Adams, D.D. ; D. Antonio Raimondi, M.D., of Lima, Peru ; Alexander Winchell, of Ann Arbor, Mich. ; Henry Pleasants, of Pottsville, Penn.

June 25.—C. William Zaremba, of St. Joseph's, Mich. ; H. R. Dresser, of London ; M. H. Crosse, of Paris ; Paul Fischer, M.D., of Paris ; M. J. R. Bourguignat, of Paris ; R. P. Montrouzier, of New Caledonia ; George French Angas, of Port Jackson, Australia ; Henry Adams and Arthur Adams, of London ; J. C. Chenu, M.D., of Paris ; Hon Edw. Chitty, of Kingston, Jamaica ; J. B. Gassies, of Bordeaux ; Sylvanus Hanley, of London ; J. Gwynn Jeffreys, of London ; Dr H. C. Küster, of Cassel ; Arthur Morelet, of Dijon ; Dr. Louis Pfeiffer, of Cassel ; Prof. O. A. L. Mörch, of Copenhagen ; Prof. F. H. Troschel, of Bonn, Prussia ; G. S. von Mohrenstern,, of Vienna ; Frederick Caillaud, of Nantes ; A. P. Terver, of Lyons ; Petit de la Saussaye, of Paris ; Wesley Newcomb, M.D., of Oakland, Cal. ; Dr. J. G. Cooper, of San Francisco ; R. E. C. Stearns, of San Francisco ; Prof. F. Poey, of Havana ; Dr. J. Gundlach, of Havana ; Dr. R. A. Philippi, of Santiago, Chili ; H. Benson, of Cheltenham, England ; Henri Drouet, of Troyes ; Dr. Aug. Baudon, of Beauvais, France ; M. C. Reclus, of Vaugirard, near Paris ; Dr. Leon Vaillant, of Paris ; Baron de Castello de Paiva, of Lisbon ; Dr. G. Von dem Busch, of Bremen ; J. C. Cox, of Sydney N. S. W. ; Jules Mabille, of Dinon, France ; Luigi Benoit, of Messina ; J. Gonzales Hidalgo, of Madrid ; Abbe Joseph Stabile, of Milan ; M. Souverbie, of Bordeaux.

July 30.—Rev. E. Johnson, of Sandwich Islands.

Aug. 27.—Geo. J. Durham, of Austin, Texas ; John Henry Gurney, of Norfolk, Eng. ; Osbert Salvin, of London ; T. C. Jerdon, M.D., of Madras, India ; Prof. J. Reinhardt, of Copenhagen, Denmark.

Sept. 24.—Alphonso Wood, of West Farms, N. Y.

Nov. 26.—Wm. S. Bingham, of Boston ; Prof. O. Root, of Hamilton College, N. Y. ; Col. E. Jewett, of Utica, N. Y.

CORRESPONDENCE OF THE ACADEMY.

For 1867.

Letters were received and read as follows :

January 29th.—Physicalish Medicinische Gesellschaft, Sept. 7, 1866 ;

Naturforschende Gesellschaft des Osterlande, Altenburg, Oct. 18, 1866 ;

K. K. Geologische Reichsanstalt, Vienna, Sept. 30, 1866 ;

K. Gesellschaft für Wissenschaften, Göttingen, severally acknowledging receipt of Proceedings.

Naturforschende Gesellschaft in Emden, Oct. 1, 1866 ;

Wissenschaftliche Verein, Luneburg, Oct. 1, 1866 ;

Naturkundige Gesellschaft in Wurtemburg, Stuttgart, Aug. 1, 1866, acknowledging receipt of Proceedings and transmitting publications.

Entomological Society, Paris, Dec. 22, 1866 ;

Naturforschende Gesellschaft zu Halle, Sept. 23, 1866 ;

Mannheim Verein für Naturkunde, Oct., 1866, severally transmitting their publication.

Smithsonian Institution, Washington, D. C., Oct. 8, 1866, acknowledging receipt of Journal.

Review of the Literary and Scientific Course, Paris, Dec. 20, 1866, accepting exchange upon certain conditions.

February 26th.—H. C. Wood, Jr., M. D., tendering his resignation as Recording Secretary.

Jos. Jeanes, resigning his position as Corresponding Secretary.

Jos. Starr, tendering his resignation as a member of the Academy.

Recorder of the Conchological Section, announcing their organization and election of officers.

April 23d—Captain Snow, offering his services to the Academy as lecturer.

April 30th.—J. Vaughan Merrick, Apr. 29, asking co-operation on the part of the Academy in the erection of new buildings for the combined scientific societies of Philadelphia.

Finance Committee of the Lyceum of Natural History of William's College, asking co-operation in a scientific expedition to South America.

J. M. S. Thackara, and Samuel H. Scudder, M.D., acknowledging receipts of notifications of election.

May 28th.—J. Ross Snowden, acknowledging his election as member.

June 25th.—Geo. W. Tryon, Jr., June 18th, accompanying the deposit of his collection of shells.

Also the following:

Wm. Procter, Jr., Phila., March 4th, 1867;

A. Heger, M. D., U. S. A., New York, March 7, 1867;

Jas. H. Little, Buckingham P. O., June 19th, 1867;

E. W. Clark, Philadelphia, July 16th, 1867;

L. H. Carpenter, Austin, Texas, Sept. 20th. 1866;

Horace B. Hare, M. D., Philadelphia, Aug. 28th, 1867, severally acknowledging their election as members of the Academy.

Abbé Joseph Stabile, Milan, Feb. 9th, 1867;

Samuel Scudder, Boston, April 8th, 1867;

Geo. P. Marsh, Florence, April 20th, 1867;

Edw. L Berthoud, Golden City, May 22d, 1867; severally acknowledging their election as correspondents of the Academy.

Royal Society of Edinburgh, Jan. 10th, 1867; acknowledging receipt of Proceedings.

A. H. Smith, M. D., U. S. A., Harts Island, Jan. 24th, 1867, requesting information respecting membership.

J. A. Heintzleman, Feb. 6th, 1867, tendering his resignation of membership.

Oliver W. Barnes, Feb. 19th, 1867, tendering his resignation of membership.

W. H. Dau, Fort St. Michaels, Sept. 30th, 1866, informing the Academy of the death of R. Kennicott.

T. Morris Perot, Feb. 1st, 1867, transmitting petition memorializing Congress upon the subject of importation of books for public libraries free from tariff rates.

Dr. Wm. Zaremba, March 14th, 1867, making inquiry relative to donations, &c.; April 1st, requesting copy of by-laws.

Chas H. Doerflinger, March 15th, 1867, transmitting donation to library.

L. W. Schmidt, March 21st, 1867, transmitting copies of his catalogue of books.

Fred'k. Fraley, Phila., March 20th, 1867, regarding the funeral expenses of Prof. Dallas Bache.

American Bureau of Mines, New York, April 18th, 1867, regarding cost of Proceeding.

James Hall, Albany, April 27th, 1867, in reference to a donation to the library.

Chas. Murray, January 26th, 1867, transmitting donation to Library.

Alexander Winchell, Ann Arbor, June 28th, 1867;

Eugene Gaussoin, Baltimore, July 19th, 1867;

F. F. Cavada, Trinidad, July 31st, 1867;

J. Gwynn Jeffreys, London, August 31st, 1867;
Henry Pleasants, Pottsville, Sept. 6th, 1867;
S. Wylie Crawford, Louisville, Ky., Sept. 22d, 1867;
M. Henri Dröuet, Dijon, Sept. 13th, 1867;
R. E. C. Stearns, San Francisco, Cal., Sept. 30th, 1867;
M. Souverbie, Bordeaux, Sept. 13th, 1867;
M. A. Moretel, Dijon, Sept. 7th, 1867;
A. Baudon, Mony, Sept. 6th, 1867;
M. Cailliaud, Nantes, October 13th, 1867;
Henry Adams, London, Oct 3d, 1867;
C. C. Gray, M. D., U. S. A., Fort Stevens, Oct. 20th, 1867;
M. Crosse, Paris, Nov. 8th, 1867;
Chas. Stodder, Boston, Dec. 14th, 1867;
Dr. P. Fischer, Paris, severally acknowledging their elections as correspondents of the Academy.

Mrs. Willard Parker, New York, Jan. 8th and 14th, 1867;
A. H Smith, M. D., U. S. A., New York, May 10th, 1867;
C. W. Zaremba, St. Josephs, May 7th, 1867;
John C. Spear, M. D., Washington, D. C., May 30th, 1866;
Smithsonian Institution, Washington, D. C., May 29th, 1867;
Thos. Clarkson, Sagua la Grande, Cuba, Aug. 26th, 1867;
Samuel Powel, Newport, R. I., July 3d, 1867, severally transmitting donations to the Museum.

A. S. Packard, Salem, Mass., Dec. 20th, 1866, requesting contributions to American Naturalist.

John K. Ralston, Norristown, Pa., June 5th, 1867, relative to election of Rev. I. Grier Ralston.

A. M. Edwards, New York, July 18th, 1867, requesting names of members desirous of co-operation with the writer in studying Diatomaceae and Desmidiaceae.

W. H. Seat, July 24th, 1867, regarding donations to Soule University.

M. Seriziat, Strasbourg, requesting orders for impressions of Lepidopterous Insects.

John W. Glass, Cincinnatti, Ohio, Sept. 1st, 1867, offering for sale specimens of natural history in his possession.

W. H. Dall, Fort Michaels, Aug. 14th, 1867, giving account of opefations of Scientific Corps for past year.

Royal Society of London, Sept. 29th, 1867, announcing the death of Prof. Michael Farraday.

DONATIONS TO THE MUSEUM.

1867.

Abbott, Miss Anna. *Sept. 5th.* One fine specimen of Venus interpurpurea, Conrad, from Florida. Through the Conchological Section.

Aldrich, F. H. *March 12th.* Twenty-eight species of Land and Fresh Water Shells, collected in the vicinity of Troy, N. Y. Through the Conchological Section.

Allen, Dr. H. See Cassin.

Ashhurst, Dr. S. *July 23d.* An alcoholic specimen of the Ribbon Fish (Trichiurus lepturus), from Egg Harbor, N. J.

Ashhurst, Francis, M. D. *Aug. 6th.* A collection of Saurian, Chelonian and Fish Bones, and some fine specimens of Teeth of Bottosaurus, from the Green Sand of Pemberton, N. J. *Dec. 3d.* A collection of remains of Fishes and Reptiles, from same locality.

Beadle, Rev. E. R. *March 7th.* Navea Newcombii, Tryon; perforating Haliotis, from Lower California. *Sept. 5th.* Three species of Cuban Shells, and two specimens of Pinna squamosa, Lam. From the Mediterranean Sea. *Dec. 5th.* Mactra lateralis, Say; Voluta Turneri; a large collection of Solens and Mactræ, &c.; also five species of Terrestrial Shells, from Syria and Java. Through the Conchological Section. *Feb. 12th.* Twenty specimens of Minerals, principally very fine specimens of Gypsum, from Iowa and Michigan. *Oct. 22d.* A large mass of Fossil Foraminifera, from Syria; Skin of a large Serpent, from South Africa. *Dec. 3d.* Female of Termes fatalis, from Ceylon.

Bennett, And. J. *Dec. 5th.* Twenty-three species of Unionidæ, from the Sciota River. Through the Conchological Section.

Biddle, Owen. *Aug. 13th.* Specimen of a common Bat.

Bland, Thos. *June 6th.* Helix uvulifera, H. cereolus, H. Postelliana. Through the Conchological Section.

Blythe, Miss Helen. *Sept. 24th.* Section of wood, cut by the beaver, from Lake Superior.

Boyer, W. H. *Oct. 15th.* Epidote, Micaceous Iron and a fine specimen of Native Silver, from Michigan; Quartz with Feldspar Crystal, Native Copper, and specimen of Magnetic Oxide of Iron, Michigan.

Brot, Aug. *Oct. 3d.* One hundred and forty species, numerous specimens of Land and Fresh Water Shells. Through the Conchological Section.

Butcher, Henry B., M. D. (U. S. Army.) *Aug. 20th.* Sixty-seven specimens Birds and two specimens Quadrupeds, from Laredo, Texas.

Carson, J. W. *Dec. 10th.* Large mass of Silicified Wood, from South Park, Colorado. Presented by Messrs. Carson and Stevens.

Cassin, John. *June 6th.* Purpura patula. Through the Conchological Section. *Aug. 20th.* Sciurus rubricaudatus, Aud. and Bach.; Audubon's type. *Oct. 22d.* A small collection of Marine Animals, from Atlantic City. Presented by Messrs. Cassin, Allen and Howell. *Dec. 3d.* Two Euphyllia pavonina, West Africa.

Cavada, Col. F. F. *March 12th.* Five species of Cuban Land Shells. *April 4th.* Twenty-six species, numerous specimens of Cuban Land and Fresh Water Shells. Through the Conchological Section.

Clarkson, Capt. Thomas. *Oct. 8th.* Specimens of American Flamingo, Phœnicopterus ruber, from South America.

Collection of Crustacea, Echinodern, and Corals, from St. Bartholomew, W. I. *April 9th.* In exchange.

Conrad, T. A. *April 9th.* Fossil Tooth of a Crocodile, from Barnsboro', N. J. *July 16th.* Collections of Fossils of the Hamilton Group, N. Y. *Aug. 6th.* A large Septaria, from Mt. Morris, N. J.

Cope, E. D. *Sept. 5th.* A collection of Unios and other Fresh Water and Land Shells, from White Sulphur Springs, Giles Co., Va. *Nov. 7th.* Specimens of Anculosa subglobosa, Say, and Melania simplex; eight species of Unio and Margaritana, from Holston Riv., Va. Through the Conchological Section. *Jan. 15th.* A collection of Fresh Water Fishes. *Jan. 22d.* Thirty-four jars of Reptiles. *Feb. 19th.* A collection of forty specimens of twenty-one species of Marine Fishes, from St. Kitts Island, West Indies. *Dec. 10th.* Nine species, twenty specimens of Reptiles, from near the city of Guatemala: five species, fifteen specimens of Fishes, from near the city of Guatemala; thirty-three species, fifty-six specimens of Reptiles, from Bahia, Brazil; an Armadillo, from Bahia; a Jaguar Skull, from Brazil; and a Bear Skull, from Monterey, Cal. *Nov. 6th.* Remains of an extinct whale, Eschrichtius cephalus, of a Basilosaurus, B. atlanticus, and of a Squalodon mento, from the miocene of Charles County, Md.; a

collection of Indian Relics, from Charles Co., Md.; ten species Unionidæ, one Anculosa, and one Goniobasis, from Holston R., Va. *Nov. 12th.* A collection of Palatine Teeth of Aetobatis arcueatus, Ag.; A. profundes, Cope; Myliobatis gigas, Cope; M. vicomicanus, Cope, Charles Co. Md.; and M. pachyodon.

Cox, Dr. J. C. *June 6th.* One hundred and twenty-two species, numerous specimens of Polynesian Shells. Through the Conchological Section.

Currier, O. C. *Feb. 7th.* Anodonta subcarinata, Currier; Physa deformis, Currier; Melantho gibba, Currier; Bulimus Tryoni, Currier, types of new species. *May 7th.* Thirty-nine species Shells, from Grand Rapids, Mich. *May 2d.* Thirty-nine species, numerous specimens, from Grand Rapids, Mich. Through the Conchological Section.

Deal, Dr. L. H., *Sept. 17th.* Large Hair Ball, from the stomach of a calf.

Dick, F. *Jan. 22d.* An Indian Stone Axe, from Billingsport, N. J.

Durham, Geo. J. *Sept. 10th* Skin of a Spermophilus Buckleyi, Slack, from Austin, Texas. *Aug. 20th.* Head of Mycteria Americana, from near Austin, Texas; first ever obtained in the United States.

Ely, Capt. R. B. *Jan. 1st.* Bothrops lanceolatus and a large Locust, from Michigan.

Eshleman, J. B. *Feb. 7th.* Melanio altilis, Lea. Through the Conchological Section.

Ennis, Jacob. *Dec. 5th.* Vivipara lineata, Val., from St. John's River, Florida. Through the Conchological Section.

Ford, John. *Sept. 5th.* Beautiful suites of specimens of Unio nasuta, U. complanatus, U. heterodon, U. ochraceus, Margaritana undulata, Anodonta undulata, and Sphærium transversum, from Twenty-seventh Ward, Philadelphia. Through the Conchological Section.

Gabb, W. M. *April 4th.* Fourteen species of Fresh Water Shells, from California. *May 7th.* A species of Limnea, and Helix Hornii, Gabb. Through the Conchological Section.

Glatfelder, Dr. Noah M. *Jan. 1st.* Slab of Stone with Crystals of Selenite, a small collection of Fossils, and another of recent Plants, from Dakota.

Grant, Alden. *Jan. 15th.* Five species of Birds, and one Mammal, from Natal Africa.

Grey, Prof. Asa. *Dec. 10th.* A collection of Plants of Australia.

Haldeman, S. S. *May 7th.* Type specimens of the Genus Limnea. *June 6th.* Type specimens of Planorbis and Physa. Through the Conchological Section.

Hall, E. *May 7th.* One hundred and four species of American Terrestrial and Fluviatile Shells. Through the Conchological Section.

Hall, Geo. W., M.D. Fossil Tooth of a Tapir, from Illinois.

Hanly, Sylv. *Feb. 12th.* One hundred and eighty-four species of Marine Shells, from Italy. Through the Conchological Section.

Hays, Dr. I. *March 26th.* Tooth of a Charcharodon in the matrix, from Japan.

Harrod, Joseph. *Nov. 19th.* Sheath of a Palm, Isthmus of Panama; Lichen from the Sequoia, and Fruit of the same, Calaveras Co., Cal.; Ivory Nut, Costa Rica; Sponge, from Nassau, B. I.; Geyserite, from the Geyser of California.

Hartman, Dr. Wm. D. *May 2d.* Three species of Shells. Through the Conchological Section.

Heister, Mrs. Caroline A. *Feb. 19th.* A collection of European Plants of the late Dr. John P. Heister, of Reading.

Homan, E. *Sept. 3d.* A Sting Ray, from Atlantic City.

Hoopes, B. A. *Oct. 22d.* Boulder of Native Copper, from Vulcan Mine, Lake Superior.

Horn, Dr. Geo. H. *May 7th.* Five species of Shells, from Texas. Through the Conchological Section.

Houston, E. J. *April 7th.* Large specimen of Cyanite, from Leiperville, Del. Co.

Hubbard, Dr. E. W. *Jan. 8th.* Helix Jacksonii, Bland, from Fort Gibson, Indian Territory. Through the Conchological Section.

Hubbard, V. B., M. D. *Sept. 10th.* Milvulus forficatus, male and female, fine specimens, from the country of the Cherokee Nation.

Howell, Dr. S. B. *Jan. 1st.* Vertebra of a Whale.

Julius, J. L. *Oct. 3d.* One specimen of Cassis, from Trinidad. Through the Conchological Section.

Kline, A. C. *Nov. 12th.* A Red Coral.

Krider, John. *Jan. 8th.* Six species of American Land Shells. Through the Conchological Section.

Lathrop, G. A. *Jan. 8th.* Eighty-four species of Shells, from Saginaw River, Mich., and its vicinity. Through the Conchological Section.

Lea, Isaac. *April 4th.* Septifer Trautwiniana, type; Columna Hainesii, Helix Peliomphila, from Japan, &c. Through the Conchological Section. *Jan. 8th.* Specimen of Kaolin, from near Kennett's Square, Chester Co., Pa. *April 16th.* Lesleyite with Pattersonite, and Pattersonite, Chester Co., Pa. *Nov. 5th.* Vermiculite, Lenni, Del. Co.; Muronite, near West Chester. *Dec. 3d.* Large specimen of Raphylite, Del. Co.

Le Conte, J. L. *Jan. 1st.* Teeth of Ptychodus; Lamna, Galeocerdo, and other Teeth and Bones of Fishes, from the cretaceous formation of Western Kansas—near Big Creek and Bunker Hill, 50 and 35 miles North-west of Fort Ellsworth; Crystals of Selenite, near Big Creek, Fossil Creek; Crystals of Barytes from Geodes, near Pond Creek, Kansas; collection of Dicotyledonous leaves, from the cretaceous formation, near Fort Ellsworth; Rocks and Fossil Shells, from along Smoky Hill Fork; Lignite, from cretaceous beds of Kansas. *Nov. 19th.* A collection of Remains of Fishes, from the cretaceous of Smoky Hill River, and chiefly from Fort Wallace: Fossil Shark Teeth, from near Fort Lyon. *Dec. 3d.* Fossil Remains of Fishes, from near Fort Wallace, Kansas; a small collection of Fossil Shells, from Kansas and New Mexico; a specimen of Turquoise, from Cerrites, near Santa Fé *Dec. 10th.* A collection of Fossil Shells, from Kansas and New Mexico.

Leeds, A. R. *Nov. 5th.* Mica, Buncombe Co., N. C.

Leidy, Dr. Jos. *May 2d.* One species of Spherium. *Sept. 5th.* Eleven species of land and fresh-water Shells from Western Virginia. Through the Conchological Section. *Aug. 13th.* Specimen of Pumiscaria glomeratus. Atlantic City.

Lewis, E. J., M.D. *Oct. 8th.* Land Tortoise, marked with date of 1829. *Dec. 5th.* Four species of Amnicola from Mohawk. Through the Conchological Section.

Lincecum, Dr. Gideon, of Texas. *April 9th.* Thirty-six jars, vials, and boxes, containing a Collection of Zoological specimens. Fourteen bottles, containing a collection of Reptiles, Spiders, &c. From Long Point, Texas. *Dec. 3d.* Specimen of White Clay, from Texas.

Mactier, Wm. L. *Aug. 6th.* A collection of six specimens of native Copper, with Malachite and Calcite, from Lake Superior, and a specimen of Peat from Ireland.

Matthews, C. W. *Dec. 3d.* Tooth of Carcharodon. From Linnes Co., Miss.

McClenahan, John. *Jan. 1st.* Sandstone concretion, assuming the form of a snake's head, from North Carolina.

Meehan, T. *Dec. 17th.* Liatris intermedia.

Mörch, Dr. Otto A. L. *May 7th.* One hundred and six species, numerous specimens of Shells from the Canary Islands, Greenland, Arabia and Chili. Through the Conchological Section.

McCoy, Dr. G. R. *Sept. 10th.* Specimen of Amblyopsis and an Astacus, from Mammoth Cave, Kent.

Miles, Prof. M. *Jan. 22d.* A collection of Reptiles.

Newcomb, W. *Sept. 5th.* Six species, fifteen specimens of Shells. Through the Conchological Section.

Parker, C. F. *Feb. 12th.* Eight species of Shells new to the Collection. *March 12th.* Pirenella turritella, Brug. From New Zealand. *May 7th.* Three species and eleven sections of Shells. *Nov. 7th.* Two species of Shells, Amphidesma and Thracia. *Dec. 5th.* One species of Ranella and one of Pleurotoma, from Panama. Through the Conchological Section.

Pease, W. H. *April 4th.* Types of nine new species. *Nov. 7th.* Types of fifty-five species of Polynesian Shells described by him. Through the Conchological Section.

Peck, S. F. *Sept. 24th.* Antique Hammer of Native Copper, from the Bohemian Mine, Greenland, Michigan, and a fragment of Copper anciently mined, found with the former.

Powel, S. *Jan. 15th.* A Sponge and Sertularian from Newport, R. I. *July 16th.* A Porpoise, Phoceana brachicium.

Rafinesque type collection of Unios from the collection of the late C. A. Poulson. Types of Rafinesque's species, with the original labels in his handwriting. Purchased and presented through the Conchological Section.

Randall, F. A. *Jan. 8th.* Three species Unio, from the Alleghany River. *Sept. 5th.* Ten species, numerous specimens of fresh-water Shells from Alleghany River. Through the Conchological Section.

Redfield, J. H. *Nov. 7th.* Four species of Marginella. Through the Conchological Section.

Resolute Mining Co. *Oct. 22d.* Crystallized Native Copper and Calcite from the Resolute Mine, Lake Superior.

Roberts, S. R. *Feb. 12th.* Four species Cypræa, new to the Collection. One specimen C. zigzag. *May 7th.* Anodonta papyracea (Anth), Tennessee. Through the Conchological Section.

Ruschenberger, Dr. W. S. W. *Jan. 1st.* Fourteen Moonstones, from Ceylon.

Scarborough, Geo. *April 4th.* Two species of Shells. Through the Conchological Section.

Sellers, G. E. *Oct. 22d.* A collection of Fossils, from the vicinity of Cincinnati.

Sergeant, J. D. *Dec. 17th.* One specimen Mallotus, Middle Atlantic Ocean.

Shippen, Dr. *Nov. 19th.* A bent slab of Marble.

Slack, Dr. J. H. *Jan. 1st.* Specimens of Hesperomys Michiganensis, Sciurus Hudsonius, and Tamias quadrivittatus; also specimens of Esox. *Nov. 19th.* Pteropus Edwardsii.

Shaw, Joseph E. *Sept. 3d.* A specimen of brown Bat (Scotophilus fuscus).

Sheafer, P. W. *March 26th.* Specimens of black band Iron Ore, from Mill Creek Shaft, near Pottsville, Penna., with impressions of Sigillaria.

Showalter, E. R. *April 4th.* One hundred and fifty-six species, 3900 specimens of Unionidæ and Melania, chiefly from Alabama. Through the Conchological Section.

Smith, C. E. *Sept. 10th.* Tufacious Moss, from Niagara.

Smith, George, M.D. *Oct. 8th.* Specimen of the Osprey, or fish-hawk, Pandion carolinensis, from Haverford, Delaware Co., Pa.

Smithsonian Institution. *Sept. 17th.* Anser Rossii, Lestris Buffoni, 2 Somateriæ, V. nigra, and 187 skins of Birds, principally from Sitka, Alaska Tertory, and the Hudson Bay Co. Territories.

Stearns, R. E. C. *Sept. 5th.* Seven species, numerous specimens, from California. Through the Conchological Section.

Stevens, W. H. See Carson Dec. 10th.

Swift, Robt. *Jan. 8th.* Skulls of the Capybara, Two-toed Sloth, Fox, Cat, Squirrel, and six Apes; three dilated hyoids of the Howling Monkey; 12 Star-fishes; Echini, Spatangi; 8 species and a Sea Fan. From St. Thomas, W. I., and South America. *Nov. 12th.* Thecadactylus rassicauda. St. Thomas, W. I.

Taggart, W. *Sept.* 17*th.* Embryo of the Black Snake.

Thompson, J. H. *Feb.* 12*th.* Helix Stuartiæ, Sowb., from the Philippines. *April* 4*th.* Type of Montacuta Gouldii. Through the Conchological Section.

Thomson, J. R. *Oct.* 8*th.* A small collection of Crustacea; an Oestrus Larva from the back of a Cow.

Tryon, Geo. W., Jr. *Feb.* 12*th.* Six specimens of Shells, exhibiting internal structure; Magilis antiquus from the Red Sea; Helix Parkeri, from Central America, &c. *March* 12*th.* Ninety-five species of Shells selected from the Poulson Collection; also about 200 duplicate species from the same Collection. *April* 4*th.* Four specimens of Cephalopods in spirits. *Sept.* 5*th.* Forty-eight species, numerous specimens of Australian Shells, together with a collection of Cephalopods and other naked Mollusks in spirits. Through the Conchological Section.

Valdespino, Jno. M. *Oct.* 8*th.* Native Blanket of the Bark of the Damaqua Tree of Brazil.

Vaux, W. S. *Sept.* 5*th.* Bulimus from Peru. Through the Conchological Section. *Feb.* 12*th.* Very fine specimen of Satin Spar, from Alston Moor, Cumberland, England. *March* 12*th.* Breccia with Remains of Reindeer, Horse and worked Flints. From Dordogne, France. A Limulus and Eryon arctiformis, in lithographic slate. Solenhofen, Bavaria. *Nov.* 12*th.* Fluor Spar with Spathic Iron. Cumberland, England. *Dec.* 10*th.* Fifteen species, 33 specimens Reptiles from near City of Guatemala. Skin of Galictis vitata, and a rodent Skull, Brazil; young King Vulture of Mexico. *Dec.* 17*th.* One specimen of Octopus, from Pacific coast, Guatemala.

Willis, J. R. *Feb.* 12*th.* Twenty species of Marine Shells from Nova Scotia. Through the Conchological Section.

Wilstach, W. P. *Aug.* 6*th.* Ninety-one species of Shells, from Australia, S. America, Palestine, etc. Through the Conchological Section.

Wood, Dr. H. C., Jr. *March* 12*th.* Four species of land Shells, from Texas. Through the Conchological Section.

Zaremba, Dr. Wm. *Aug.* 20*th.* Collection of Nests and Eggs of Birds of 15 species, from St. Josephs, Michigan.

DONATIONS TO THE LIBRARY.

1867.

JOURNALS AND PERIODICALS.

SWEDEN.

Upsaliæ. Nova Acta Regiæ Societatis Scientiarum Upsaliensis. Seriei Tertiæ. Vol. VI., Fasc. Prior, 1866. From the Society.

DENMARK.

Kjobenhavn. Oversigt over det Kongelige danske Videnskabernes Selskabs Forhandlingar og dets Medlemmers Arbeider i Aaret 1866–67, Nos. 2—6; also 1867, Nos. 1—4. Volume for 1864. 1864–66. From the Society.

Videnskabelige Meddelelser fra den Naturhistoriske Forening i Kjöbenhavn for Aaret 1865. Udgivne af selskabets Bestyrelse, 1866. From the Society.

NORWAY.

Christiania. Det Kongelige Norske Frederiks Universitets, Aarsberetning for Aaret 1864–65. From the University.

Forhandlinger i Videnskabs-selskabet i Christiania, Aars 1846—1865. From the Society.

RUSSIA.

Moscow. Bulletin de la Société Imperiale des Naturalistes de Moscou. Année 1865, No. 3; 1866, Nos. 2, 3 and 4. From the Society.

Riga. Arbeiten des Naturforscher-Vereins zu Riga. Neue folge. 1es Heft. From the Society.

Correspondenzblatt des Naturforschenden Vereins zu Riga. 15er Jahrg. From the Society.

St. Petersburg. Horæ Societatis Entomologicæ Rossicæ variis sermonibus in Rossia usitatis editæ. Tome III., Nos. 1—4. Tome IV., Nos. 1—4. 1865–66. From the Society.

Bulletin de l'Academie Impériale des Sciences. Tomes X. and XI. From the Society.

Mémoires de l'Academie Impériale des Sciences. VII. Serie. Tome X., Nos. 1 to 16. Tome XI., Nos. 1—8. 1867. From the Society.

HOLLAND.

Amsterdam. Verslagen en Mededeelingen der k. Akademie van Wetenschappen, Afdeeling Naturkunde Tweede Reeks Eerste und Negende Deel, 1866. From the Society.

Processen-Verbaal van de Gewone Vergaderingen der Koninklijke Akademie van Wetenschappen, 1867. From the Society.

Jaarboek van de k. Akademie van Wetenschappen voor 1865. From the Society.

Haarlem. Archives Néerlandaises des Sciences Exactes et Naturelles publiées par la Société Hollandaise des Sciences a Haarlem. Tome I., Livres 3 and 4; Tome II., Livres 1 and 2. From the Society.

Naturkundige Verhandelingen van de Hollandsche Maatschappij der Wetenschappen te Haarlem. Tweede Verzameling. 24er Deel, 1866. From the Society.

Hague. Archives Neerlandaises des Sciences Exactes et Naturelles publiées par la Société Hollandaise des Sciences a Haarlem. La Haye, 1866. Tome I., 1er and 2er Livr., 1866. From the Society.

Rotterdam. Nieuwe Verhandelingen van het Batäafsch Genootschap der Proefondervindelijke Wissbegeertete Rotterdam. Twaalfde Deel. 2 and 3 Stuk, 1865. From the Society.

Utrecht. Nederlandsch Meteorologisch Jaarboek voor 1866, uitgegeven door het Koninklijk Nederlandsch Meteorologisch Instituut. Eerste und Tweede Deel, 1866–67. From the Institute.

GERMANY.

Altenburg. Mittheilungen aus dem Osterlande, herausgegeben von der Naturforschenden Gesellschaft zu Altenburg. 17er Band, 3es and 4es Heft, 1866. From the Society.

Berlin. Zeitschrift der Deutschen geologischen Gesellschaft. 18 Band, 2, 3 and 4 Heft, 1866; 19 Band, 1 Heft, 1867. From the Society.

Archiv für Naturgeschichte, herausgegeben von Dr. F. H. Troschel. 31er Jahrg. 5es Heft; 32er Jahrg, 2—5 Heft, 33er Jahrg, 1es Heft., 1865—1867. From the Editor.

Monatsbericht der k. Preussischen Akademie der Wissenschaften. From Aug., 1866, to July, 1867. From the Society.

Berliner Entomologische Zeitschrift. Herausgegeben von dem Entomologischen Vereine in Berlin. Zehnter Jahrg., 1866, 4es Vierteljahrsheft, and 11er Jahrg., 1es and 2es Vierteljahrsheft. From the Society.

Mathematische und Physikalische Abhandlungen der k. Akademie der Wissenschaften zu Berlin. Aus dem Jahre, 1865. From the Society.

Wochenschrift des Vereines zur Beförderung des Gartenbaues in den K. P. Staaten für Gärtnerei und Pflanzenkunde. Nos. 1 to 52, for 1866; and Nos. 1 to 26, for 1867. From the Society.

Zeitschrift für die gesammten Naturwissenschaften. Herausgegeben von dem Naturw. Vereine für Sachsen und Thuringen in Halle. Jahrgang 1866, 26, 27, 28 Band. From the Society.

Bonn. Verhandlungen des Naturhistorischen Vereines der preussischen Rheinlande und Westphalens. 23er Jahrg., 1es and 2es Heft. Bonn, 1866. With a geological map of the Prussian Rheinlands. From the Society.

Braunschweig. Archiv für Anthropologie, Zeitschrift für Naturgeschichte und Urgeschichte des Menschen. Erster Band, 2es Heft, und Zweiter Band, 1es, 2es und 3es Heft, 1867. From the Subscribers to the Library Fund.

Bericht über die XIV. Versammlung der Deutschen Ornithologen-Gesellschaft im Waldkater zu Halberstadt und Braunschweig. From the Society.

Bremen. Abhandlungen der Naturwissenschaftlichen Vereine zu Bremen. 1 Band, 1 und 2 Heftes. From the Society.

Jahres-Bericht des Schwedischen Heil-Gymnastischen Instituts in Bremen, 1866. From the Institute.

Brünn. Verhandlungen des Naturforschenden Vereines in Brünn. IV. Band, 1865, 1866. From the Society.

Cassel. Malakozoologische Blätter. 13 Band, p. 145, to 14 Band, p. 144. From the Library Fund.

Journal für Ornithologie. Herausgegeben von Dr. Jean Cabanis und Dr. Ed. Baldamus. From Heft. III., 14 Jahrg., to Heft. IV., 15 Jahrg. From the Wilson Fund.

Danzig. Schriften der Naturforschenden Gesellschaft in Danzig. Neue Folge. 1es Band, 3 und 4 Heft, 1866. From the Society.

Dresden. Sitzungsberichte der Naturwissenschaftlichen Gesellschaft Isis zu Dresden. Jahrg. 1866, Nos. 1—12. From the Society.

Novorum Actorum Academiæ Cæsareæ Leopoldino-Carolinæ Germanicæ Naturæ Curiosorum. Tome 24, 1867. From the Society.

Emden. Einundfünfzig und Zweiundfünfzigster Jahresbericht der Naturforschenden Gesellschaft in Emden, 1865. Von Hermann Meier, 1866. From the Society.

Festschrift der Naturforschenden Gesellschaft, for 1864. From the Society.

Frankfurt-am-main. Der Zoologische Garten, VII. Jahrg. 1866, Nos. 7—12, and VIII. Jahrg., 1867, Nos. 1—6. From the Editor.

Jahresberichte über die Verwaltung des Medicinalwesens die Krankenanstalten. VII. Jahrg., 1863—1867. From the Society.

Abhandlungen herausgegeben von der Senckenbergischen Naturforschenden Gesellschaft. 6es Band, 1 und 2es Heft., 1866. From the Society.

Freiburg. Berichte über die Verhandlungen der Naturforschenden Gesellschaft zu Freiburg I. B. 1867. From the Society.

Giessen. Zwölfter Bericht der Oberhessischen Gesellschaft fur Natur-und Heilkunde, 1867. From the Society.

Gotha. Mittheilungen aus Justus Perthes Geographischer Anstalt, von Dr. A. Petermann. 1866, No. IX. to 1867, No. X. Ergänzungsheft, Nos. 19—21. From the Wilson Fund.

Göttingen. Nachrichten von der K. Gesellschaft der Wissenschaften und der Georg-Augusts-Universität aus dem Jahre 1866. From the Society.

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Hamburg. Abhandlungen aus dem Gebiete der Naturwissenschaften herausgegeben von dem Naturwissenschaftlichen Verein in Hamburg. IV. Band, 4 Abth.; V. Band, 1 Abth., 1866. From the Society.

Leipzig. Schriften der Gesellschaft zur Beförderung der gesammten Naturwissenschaften zu Marburg. Supplement Heft. Marburg, 1866. From the Society.

Zeitschrift für Wissenschaftliche Zoologie. Herausgegeben von Carl T. v. Siebold und Albert Kölliker. 16er Band, 4es Heft; 17er Band, 1es—4es Heft. From the Wilson Fund.

Archiv für Anatomie Physiologie und wissenschaftliche Medecin. Jahrg. 1866 Heft 4, to 1867 Heft 4. From the Subscribers to the Library Fund.

Jenaische Zeitschrift für Medecin und Naturwissenschaft herausgegeben von der Medecinisch-Naturwissenschaftlichen Gesellschaft zu Jena. 3er Band, 1es, 2es und 3es Heft, 1867. From the Society.

Berichte über die Verhandlungen der k. S. Gesellschaft der Wissenschaften zu Leipzig; Mathem. Physische Classe, 1865; 1866, I., II. und III. From the Society.

Abhandlungen der Mathematisch-physischen Classe der k. Sachsischen Gesellschaft der Wissenschaften. VIII. Band, Nos. 2 and 3, 1866. From the Society.

Preisschriften gekrönt und herausgegeben von der fürstlich Jablonowskischen Gesellschaft zu Leipzig. XIII., 1867. From the Society.

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Mannheim. Zweiunddreissigster Jahresbericht des Mannheimer Vereins für Naturkunde, 1866. From the Society.

München. Sitzungsberichte der K. B. Akademie der Wissenschaften zu München. 1865, II., and 1866, I. From the Society.

Abhandlungen der Philosophisch-Philol. Classe der K. B. Akademie der Wissenschaften. 10er Band, 3e Abth. Elfter Band, 1e Abth. Historischen Classe. 10er Band, 2e Abth. 1866. From the Society.

Neubrandenburg. Archiv des Vereins der Freunde der Naturgeschichte in Mecklenburg. 20 Jahrg., 1866. From the Editors.

Offenbach-am-Main. Siebenter Bericht des Offenbacher Vereins für Naturkunde über seine Thätigkeit vom 14 Mai 1865, bis zum 31 Mai 1866. From the Society.

Prag. Sitzungsberichte der K. B. Gesellschaft der Wissenschaften in Prag. Jahrgang. 1865 und 1866. From the Society.

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Regensburg. Flora oder allgemeine botanische Zeitung herausgegeben von der K. Bayer. botanischen Gesellschaft. Neue Reihe. 24 Jahrg., 1866. From the Society.

Correspondenz-Blatt des zoologischen Mineralogischen Vereines in Regensburg. Zwanzigster Jahrgang, 1866. From the Society.

St. Polten. Drittes Programm der Nö. Landes-Ober-Realschule in St. Polten, 1866. From the Society.

Jahresbericht Turnvereins in St. Polten für das dritte Vereinsjahr 1865—6—1866. From the Society.

Stuttgart. Württembergische Naturwissenschaftliche Jahreshefte. 21 und 22 Jahrgang; 23 Jahrg., 1es Heft. From the Society.

Neues Jahrbuch für Mineralogie, Geologie und Palæontologie. Jahrg. 1865, 7es Heft, to 1867, 5es Heft. From the Editor.

Vienna. Jahrbuch der K. K. geologischen Reichsanstalt. Jahrg. 1866, XVI. Band, Nos. 3 and 4; 1867, No. 1. From the Society.

Sitzungsberichte der K. Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe. From 1861 to 1867. Zweite Abtheilung, 9 Heft. From the Society.

Denkschriften der kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe. 25er Band, 1866. From the Society.

Verhandlungen der K. K. zoologisch-botanischen Gesellschaft in Wien. Jahrgang 1866, XVI. Band. From the Society.

Würzburg. Würzburger Naturwissenschaftliche Zeitschrift, herausgegeben von der Physikalisch-medecinischen Gesellschaft. 6er Band, III. Heft, 1866. From the Society.

SWITZERLAND.

Basel. Verhandlungen der Naturforschenden Gesellschaft in Basel. 4er Theil, 3es Heft, 1866. From the Society.

Geneva. Bibliothèque Universelle et Revue Suisse. Archives des Sciences Physiques et Naturelles. Nouvelle Periode. Nos. 106 to 118. From the Editors.

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Mémoires de la Société de Physique et d'Histoire Naturelle. Tome XVIII., 2e Partie, and Tome XIX., 1er Partie. 1867. From the Society.

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Dijon. Mémoires de l'Académie Impériale des Sciences, Arts et Belles-Lettres de Dijon. Annees 1864–65, 1865–66. From the Society.

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Annales des Sciences Physiques et Naturelles d'Agriculture et d'Industrie, publiées par la Société Impériale d'Agriculture, etc. Troisième Serie, Tomes IX. et X., 1865 et 1866. From the Society.

Montpellier. Académie des Sciences et Lettres de Montpellier, Mémoires de la Section de Medecine. Tome IV., 1er et 2er Fasc: Section des Sciences, Tome VI., 1er Fasc, 1863–64. From the Society.

Mons. Bulletin des Séances de la Société des Sciences, des Arts et des Lettres du Hainaut, 1864–65. From the Society.

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Magasin de Zoologie. Journal publie par F. E. Guerin. Mollusca, 1830 to 1844. Deposited by Geo. W. Tryon, Jr.

Bulletin mensuel de la Société Impériale Zoologique d'Acclimatation. 3me Serie, from Tome III., No. 11, to Tome IV., No. 10. From the Society.

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J. D. Sergeant	100	E. M. Needles	25
Joseph P Smith	100	John Pearsall	25
James Spear	100	C. F. Parker	25
W. P. Tatham	100	Wm. W Paul	25
Samuel B. Thomas	100	Geo. A. Smith	25
B. T. Tredick	100	T. Guilford Smith	25
Wm. P. Turnbull	100	D. L. Woods	25
Wm. G. Thomas	100		
Alfred Vezin	100	Total	$108,803
Henry A. Vezin	100	Aggregate of subscriptions paid	
H. M. Watts	100	up to Decem. 31	$93,803

MEMBERS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA,

From the origin of the Society to January 1st, 1868.

☞ Names of members known to be deceased are in *italics*. Names of life members are preceded by an asterisk (*). Names of members who are not residents of the city are followed by the letters (N.R.) Names of those who were originally elected correspondents, and became members by removal to the city, are followed by (corres.) The names of those who have resigned, or who have forfeited their membership, are not included. Correspondents are regarded as members when they become permanent residents in the city.

Allinson, N. S., M.D., Dec. 1812.
Anthony, Thomas, Jan. 1813.
Abert, Col. J. J. (N.R.), Oct. 1828.
Alden, Charles Henry, June, 1837.
**Ashmead, Samuel*, Sept. 1839.
Allen, Nathan, M.D., May, 1841.
Ashmead, Samuel B., Jan. 1843.
Allen, Wm. H., Aug. 1851.
Allen, J. M., M.D., April, 1852.
*Ashhurst, Lewis R., May, 1853.
Agnew, Wm. G. E. (N.R.), May, 1853.
Atlee, Walter F., M.D., May, 1857.
*Audenreid, Lewis, Feb. 1859.
Ashhurst, John, M.D., Oct. 1860.
*Ashhurst, Wm. H., Feb. 1861.
Allen, Harrison, M.D., July, 1862.
*Austin, John B., Jan. 1867.
*Ashhurst, Samuel, M. D., March, 1867.
*Ashhurst, Francis, M. D., March, 1867.
*Antelo, A. J., Dec. 1867.

*Barnes, John, M.D. (N.R.), April, 1812.
**Barton, Edward*, M.D., Aug. 1815.
*Brown, Moses, Feb. 1817.
**Biddle, Nicholas*, Jan. 1818.
**Brewer, John M.* (corres.), Oct. 1820.
Bowen, George T., Nov. 1822.
Birch, Wm. Y., Dec. 1823.
Bonaparte, Charles L. (N.R.), Feb. 1824.
*Bancker, Charles N., April, 1824.
**Beck, Charles F.*, M.D., June, 1827.
Bache, Alex. Dallas (N.R.), Jan. 1829.
Bond, Henry, M.D., Jan. 1830.
**Burrough, Marmaduke*, M.D., Nov. 1830.
*Bridges, Robert, M.D., Jan. 1835.
Bowie, Thomas L., Dec. 1835.
Browne, Peter A., May, 1841.
*Baird, S. F. (N.R.) (corres.), Aug. 1842.
*Biddle, Alexander, Aug. 1848.
Barton, T. Pennant (N.R.), April, 1849.
Belknap, Henry (N.R.), May, 1849.
*Biddle, Clement, May, 1850.
Brinton, John H., M.D., June, 1851.
*Budd, Chas. H., M.D. (N.R.), Mar. 1852.
Boller, Henry J., April, 1852.
Buckley, Ed. S., May, 1852.
**Biddle, Henry J.*, Aug. 1852.
Booth, James C., Sept. 1852.

*Biddle, Thomas, May, 1853.
*Brown, John A., May, 1853.
*Brown, David S., May, 1853.
*Brown, Joseph D., May, 1853.
Bullitt, John C., July, 1853.
Borda, Eugene, Sept. 1854.
*Barton, Isaac, March, 1855.
*Barcroft, Stacy B., July, 1855.
Brower, Robt. F., M.D. (N.R.), Nov. 1855.
*Brasier, Amable J., March, 1856.
Boker, Chas. S., M.D., June, 1856.
Binney, W. G., Sept. 1856.
Bertholet, P. P., M.D. (N.R.), Mar. 1857.
Bennett, Daniel R. (N.R.), Feb. 1858.
*Brown, Joseph Johnson, March, 1858.
Breed, Rev. Wm. P., June, 1858.
*Blight, Atherton, July, 1858.
Butler, Pierce, Aug. 1858.
*Bohlen, John, Feb. 1859.
*Biddle, Thos. A., March, 1859.
*Budd, John B., June, 1859.
Bell, John G. (N.R.), May, 1860.
Bolling, Robt., M.D., Nov. 1860.
*Bucknell, Wm., March, 1861.
Brown, A. D. (N.R.), Nov. 1861.
Billings, John S., M.D., Nov. 1862.
Briggs, Robert, Jan. 1864.
Bonsall, Chas. F., Nov. 1864.
Bryant Henry, M.D. (N.R.), May, 1865.
*Browning, Edward, June, 1865.
Barnard, Vincent, Sept. 1865.
Bready, John E., Sept. 1865.
*Burk, Isaac, Dec. 1865.
Beadle, Rev. E. R., Jan. 1866.
Bland, Jas. H. B., Jan. 1866.
Boardman, Rev. Geo. D, April, 1866.
Butcher, Henry B., M.D., June, 1866.
*Baird, Wm. S., Jan. 1867.
Bodine, F. L., Feb. 1867.
*Borie, Charles H., Feb. 1867.
Bellows, Horace M., M.D., Feb. 1867.
Beman, Rev. I. L., March, 1867.
*Bohlen, Miss, March, 1867.
*Borie, Beauveau, April, 1867.
*Borie, Adolph E., April, 1867.
*Baird, Matthew, April, 1867.
*Benson, Gustavus S., April, 1867.
*Blanchard, Wm. A., April, 1867.
*Beach, O. Nichols, May, 1867.
Bement, Clarence S., May, 1867.
*Bayard, C. P., May, 1867.
*Baird, John, May, 1867.
*Betts, Richard K., Dec. 1867.
Brown, Geo. W., M.D., Dec. 1867.

Correa de Serra, Joseph, Feb. 1814.
Coze, Alexander S., Feb. 1815.
*Collins, Zaccheus, March, 1815.
Cleaver, Isaac, M.D., Jan. 1817.
*Clark, Edward (N.R.), Jan. 1817.
*Carmalt, Caleb (N.R.), Aug. 1817.
*Coates, Benj. H., M.D., April, 1818.
*Carpenter, Geo. W., July, 1825.
*Clark, John Y., M.D., Feb. 1826.
*Conrad, Solomon W., March, 1826.
Conrad, Timothy A., Jan. 1831.
Carson, Joseph, M.D., Oct. 1833.
Chase, Heber, M.D., Aug. 1836.
*Clay, Joseph A., Aug. 1837.
Camac, Wm. M., March, 1839.
*Cresson, Chas. C., Sept. 1840.
*Cassin, John, Sept. 1842.
Curtis, Josiah (N.R.), June, 1843.
Cuesta, Fernando de la (N.R.), Nov. 1844.
Clemm, Charles (N.R.), Oct. 1847.
*Cope, Caleb, Jan. 1848.
*Cooke, John, Jan. 1848.
Caldcleugh, Robert A., Nov. 1851.
*Camac, Wm., M.D., April, 1852.
*Claghorn, James L., July, 1852.
*Collet, Mark W., M.D., Sept. 1852.
Corse, James M., M.D., Nov. 1852.
*Cresson, John C., April, 1853.
Collins, Percival, Sept. 1853.
Cadwalader, Wm., March, 1855.
Clements, Richard, M.D., July, 1855.
Cresson, Chas. M., M.D., March, 1856.
*Cope, Alfred, July, 1856.
Cleburne, Wm. (N.R.) March 31, 1857.
Carter, Robt., M.D., April, 1857.
*Cummins, Daniel B., June, 1857.
Caldwell, H. Clay, M.D., Nov. 1857.
Cuthbert, Mayland, Dec. 1857.
Covey, Edward N., M.D. (N.R.), Dec. 1857.
Clarke, Edw. S., Jan 1858.
Cresson, Ezra T., April, 1858.

Coleman, Geo. Dawson (N.R.), Apr. 1858.
Clark, T. Edwards (N.R.), Dec. 1858.
*Clark, J. Hinckley, March, 1859.
*Cox, James S., June, 1859.
Cram, Capt. T. J. (N.R.) Oct. 1859.
Cox, Brinton, Dec. 1859.
Comly, Franklin A., Feb. 1860.
Coates, Andrew (N.R.), May, 1860.
Cregar, Philip A., June, 1860.
Cleborne, Chris. J., M.D., July, 1860.
*Carpenter, Geo. W. Jr., Oct. 1860.
Carbonell, Felix B. (N.R.), Dec. 1860.
*Canby, Wm. M. (N.R.), Feb. 1861.
Conrad, Thomas K. (N.R.) Feb. 1861.
*Conarroe, Geo. M., Feb. 1861.
*Cope, Edward D., July, 1861.
**Crozer*, *John P.*, March, 1862.
Curtis, Edw., M.D., July, 1863.
Coxe, Eckley, Jan. 1865.
Childs, Geo. W., Jan. 1866.
Carpenter, L. Henry, Major, June, 1866.
Crawford, S. Wylie, Gen., M.D., Aug. 1866.
Calhoun, Maj. A. R., Dec. 1866.
*Cope, Francis R., Feb. 1867.
*Cope, Thomas P., Feb., 1867.
*Cope, Miss R. A., Feb. 1867.
*Carpenter, Samuel P., Feb. 1867.
*Colwell, Stephen, Feb. 1867.
*Cooper, Lewis, March, 1867.
Comegys, Benj. B., March, 1867.
*Coxe, Charles S., April, 1867.
*Campbell, A., April, 1867.
*Clark, E. W., May, 1867.
*Clark, Clarence H., May, 1867.
*Clark, Frank H., May, 1867.
*Crease, Orlando, May, 1867.
*Cheston, D. Murray, M.D., May, 1867.
*Clyde, Thomas, May, 1867.
*Cooke, Jay, May, 1867.

**Dobson*, *Judah*, Nov. 1813.
Davis, David Jones, June, 1815.
*Dulles, Joseph H., Feb. 1816.
**Deitz*, *Rudolph*, Jan. 1821.
Dunn, Nathan (corres.), June, 1828.
Davis, Chas., M.D. (N.R.), March, 1842.
Dickson, S. Henry, M.D., (cor.), Feb. 1843.
Darrach, Wm., M.D., May, 1844.
Dundas, Jas., Aug. 1844.
*Dickeson, M. W., M.D., Oct. 1846.
*Da Costa, J. C., M.D., Feb. 1852.
Ducachet, Rev. H. W., D.D., April, 1852.
Durand, Elias, April, 1852.
*Dunglison, Robley, M.D., Jan. 1853.
*Draper, Edmund, May, 1853.
Dock, Geo., M.D. (N.R.), Feb. 1854.
Dunlap, Thos., Dec. 1856.
*Dreer, Ferdinand J.. April, 1857.
Da Costa, John C., Sr., June, 1857.
Da Costa, John C., Jr., June, 1857.
Drayton, Henry E., M.D., April, 1858.
*Dimpfel, F. P., April, 1858.
*Davidson, Geo., Aug. 1858.
Dow, John M. (N.R.), Sept. 1858.
Da Costa, Geo. J., Oct. 1858.
Darrach, Jas. A., M.D., Nov. 1858.
Darby, John T., M.D. (N.R.), March, 1859.
Davis, John C., June, 1859.
Downie, T. C. (N.R.), Aug. 1859.
*Drexel, Jos. W., June, 1860.
*Dieffenbaugh, E., Dec., 1865.
De Figaniere, Alfonso (N.R.), Mar. 1866.
Durborow, Chas. B., March, 1866.
Deal, Lemuel J., M.D., April, 1866.
Dreer, Henry A., May, 1866.
Dixon, W. C., M.D., Oct. 1866.
Davids, Hugh, Dec. 1866.

Eberle, John, M.D., April, 1819.
**Ellmaker, Levi*, April, 1829.
Elwyn, Alfred L., M.D., Dec., 1831.
Evans, Edm. C., M.D. (N.R.), Oct. 1838.
**Ellet, Chas.*, Jr., April, 1842.
*Edwards, Amory (N.R.), March, 1852.
Emerson, G., M.D., Aug. 1853.
Ennis, Jacob, Feb. 1857.
Eastwick, Edward P. (N.R.), May, 1857.
Edwards, Arthur M. (N.R.), Sept. 1858.
Egbert, Daniel, M.D. (N.R.), Oct. 1858.
Emlen, J. Norris, April, 1859.
Elliot, D. G. (N.R.), May, 1860.
Evans, Rowland E., Nov. 1860.
Evans, Wm., Jr., Feb. 1866.
Edwards, Edward B., Jan. 1867.
*Earp, Thomas, March, 1867.

Frazer, Robert, April, 1814.
**Fisher, Joseph*, May, 1821.
Fisher, Thomas, April, 1824.
Foster, Wm. A., Nov. 1833.
Foster, Hudson S., Jan. 1834.
Frazer, John F., Sept. 1835.
French, Benj. F. (corres.), Jan. 1843.
**Frost, John*, Sept. 1844.
Foulke, Wm. Parker, Nov. 1849.
*Fisher, Jas. C., M.D. (N.R.), July, 1850.
*Fahnestock, Geo. W., Aug. 1852.
**Fisher, Charles Henry*, May, 1853.
*Farnum, John, May, 1853.
*Fisher, J. Francis, May, 1853.
*Fell, J. G., May, 1853.
Forbes, W. S., M D., Sept 1856.
Francfort, Eug., M.D. (N.R.), Oct. 1856.
Fassitt, Louis, M.D., Jan. 1857.
Fry, J. Reese, Jan. 1857.
Fryer, Blancour E., April, 1858.
Foltz, Jonathan, M.D., May, 1859.
Field, Thos. Y., Aug. 1859.
Frampton, L. A., M.D., (N.R.), Sept. 1859.
Fricke, Albert, M.D., Nov. 1859.
Feltus, Henry J., Nov. 1859.
Fry, Horace B., Dec. 1859.
Felton, Samuel M. (N.R.), Feb. 1860.
Foard, A. J., M.D., Dec. 1860.
Furness, H. H., Nov. 1861.
Fiot, Augustus, Jan. 1864.
Frazer, Robert, Jan. 1866.
Febiger, Christian C., May, 1866.
Fenimore, Jason L., June, 1866.
Ford, John, Dec. 1866.
Farnum, J. Edwards, Jan., 1867.

**Gilliams, Jacob* M.D. (found.), Jan. 1812.
Griffith, R. Eggleston, M.D., May, 1815.
Godman, John D., M D., July, 1821.
Goddard, Paul B., M.D., Feb. 1829.
Griscom, Samuel S., Nov. 1830.
Gibbons, Wm. P. (N.R.), Nov. 1833.
Gumbes, Sam. Wetherill, April, 1834.
*Gerhard, Wm. W., M.D., Nov. 1835.
Gambel, Wm., M.D., Aug. 1843.
Germain, Lewis J. (N.R.), April, 1846.
Goddard, Kingston, Rev. (N.R.), Jan. 1848.
Grant, Wm. Robertson, M.D., Dec. 1849.
Genth, Fred. A., M.D., April, 1852.
*Greene, Francis V., M.D. (N.R.) Sept. 1852.
**Griffith, Robert E.*, Sept. 1852.
*Graff, Frederic, May, 1853.
**Grigg, John*, May, 1853.
Guillou, Constant, March, 1854.
Geyelin, Emile, Sept. 1854.
**Guex, John A.*, Nov. 1854.
Gibbs, George (N R.), Jan. 1856.
Garrigues, S. S., M.D. (N.R.) June, 1856.
Gobrecht, W. H. (N.R.), M.D., July, 1856.
Griffith, Robt. E , M.D., Oct. 1856.
Gross, Saml. D., M.D., Dec. 1856.
Gorgas, Albert C., M.D., Feb. 1857.
Guillou, Victor, Oct. 1858.
Grier, Wm. P., M.D., June, 1859.
Greenbank, Richard M., M.D., Oct. 1859.
Gabb, Wm. M. (N.R.), Jan. 1860.
Grubb, Edw. Burd (N.R.), April, 1860.
Goodman, J. R., M.D., March, 1864.
*Grant, Gen. Ulysses S., July, 1865.
*Graeff, John E., Feb. 1866.
*Garrett, Philip C., Feb. 1866.
Gilbert, Wm. K., M D., May, 1866.
Guier, Geo. M.D. (N.R.), June, 1866.
*Grant, Wm. S., Dec. 1866.
Gibbons, Charles, Jan., 1867.
*Greble, Edwin, Jan., 1867.
*Gratz, Robert H., April, 1867.
*Gibson, Henry C., July, 1867.
*Gibson, John, July, 1867.

**Haines, Reuben*, Nov. 1813.
**Hare, Robert*, M.D., Nov. 1813.
Hazard, Saml. (corres.), Jan. 1814.
**Harlan, Richard*, M.D., Oct. 1815.
*Hays, Isaac, M.D., July, 1818.
Hentz, N. M. (N.R.), May, 1819.
**Hembel, William*, Sept. 1824.
*Hering, C., M.D., (corres.), Oct. 1826.
Horsfield, S. C. C. (N.R.), Oct. 1830.
Huffnagle, Chas., M.D. (N.R.), Nov. 1830.
**Hallowell, Edw.*, M.D., Feb. 1834.
**Harris, Edward* (N.R.), Aug. 1835.
*Haldeman, S. S. (N.R.), Jan. 1837.
**Holmes, Chas.*, Feb. 1838.
*Haines, John S., March, 1841.
Heister, J. P., M.D. (N.R.), Nov. 1843.

Heermann, Adolphus L., M.D., April, 1845.
Hartshorne, Edw., M.D., May, 1847.
*Haines, Robt. B., Jan. 1848.
Henderson, A.A., M.D. (corres.)July, 1848.
**Horner, Wm. E.*, M.D., Feb. 1849.
Henry, Bernard, M.D., May, 1849.
Hopkinson, Joseph, M.D., Feb. 1852.
*Hewson, Addinell, M.D., Jan. 1853.
Hanson, H. Cooper, Feb. 1853.
*Hallowell, Morris L. (N.R.), May, 1853.
**Hutchinson, J. Pemberton*, May, 1853.
Harrison, Joseph, Jr., Aug. 1854.
Hilgard, Theo. C., M.D. (N.R.), Oct. 1854.
Hooper, Wm. H., M.D., Dec. 1854.
Hunt, Wm., M.D., Jan. 1855.
Hartshorne, Henry, M.D., April, 1855.
Hagedorn, C. F., Aug. 1855.
*Humphreys, Geo. A., Sept. 1855.
Hering, C. J. (N.R.), Sept. 1855.
Howell, Saml. B., M.D., Nov. 1855.
*Hayes, Isaac I., M.D., Jan. 1856.
*Hoopes, B. A., Feb. 1856.
Hayden, F. V., M.D. (corres.), Mar. 1856.
Halsey, Wm. S., M.D., April, 1857.
Haldeman, Rich. J. (N.R.), Aug. 1857.
Harlow, Louis D., M.D., Aug. 1857.
Hoyt, Wm. D., M.D., Feb. 1858.
Hart, Harry C., M.D., March, 1858.
*Hutchinson, Jas. H., M.D., April, 1858.
Huntington, David L., M.D., April, 1858.
*Hunt, J. Gibbons, M.D., July, 1858.
*Henszey, W. C., Jan. 1859.
Hare, Robt. H , Feb. 1859.
*Haseltine, John, April, 1859.
*Haseltine, Ward B., April, 1859.
Horner, Alfred, June, 1859.
*Hand, James C., July, 1860.
Hepburn, Jas. (N.R), June, 1863.
Horstmann, Wm. J., Dec. 1863.
Hugel, A., Sept. 1865.
*Hartshorne, Chas., Feb. 1866.
Hunt, Clemmons, March, 1866.
Hoopes, Josiah (N.R.), April, 1866.
*Haddock, Daniel, Jr., May, 1866.
*Huston, Samuel, May, 1866.
Horn, Geo. H., M.D., July, 1866.
Houston, Edwin J., Dec. 1866.
Haseltine, C. F., Jan., 1867.
Hacker, Wm., Feb. 1867.
*Haines, Miss Ann, Feb. 1867.
*Haines, Miss Jane R., Feb. 1867.
Heger, Anthony, M.D., Feb. 1867
*Hay, William, April, 1867.
*Houston, H. H., April, 1867.
*Haseltine, Frank, May, 1867.
*Hammitt, B., June, 1867.
Hare, H. Binney, M.D., Aug. 1867.
Hinkle, A. G., M.D., Sept. 1867.
Hassler, F. A. M.D., Nov. 1867.

Jones, Thos. P., M.D., Dec. 1812.
**James, Thos. C.*, M.D., March, 1814.
**Jessup, Augustus E.*, Nov. 1818.
Johnson, Walter R. (N.R.), Feb. 1827.
*Jaudon, Samuel (N.R.), Jan. 1836.
Jackson, Isaac R., Aug. 1841.
*Jordan, John, Jr., Jan. 1851.
*Jeanes, Joseph, May, 1853.
*Jeanes, Samuel, Jan. 1856.
*Jessup, Edw. A., Nov. 1857.
Janeway, John H., M.D. (N.R.) Sept. 1858.
Judson, Oliver A., M.D., Oct. 1858.
Johnson, Christopher (N.R.), Dec. 1858.
Johnston, Alex., March, 1860.
Jenks, Wm. Furness (N.R.), Oct. 1863.
Jones, Wm. Forster, Jan. 1866.
Jayne, Eben C., Dec. 1866.
*Jeanes, Joshua T., Dec. 1866.
Jenkins, Wilson M., Jan. 1867.

**Kneass, Wm.*, May, 1814.
**Keating, Wm. H.*, April, 1816.
Keagy, J. M., M.D., Jan. 1843.
Kane, Elisha K., Jan. 1843.
*Kilvington, Robert, April, 1843.
King, Chas. R., M.D., June, 1843.
Kern, Richard H., May, 1847.
Kern, Benj. J., M.D., Sept. 1847.
Kern, Edward M. (N.R.), Oct. 1847.
Keller, Wilhelm, M.D., Nov. 1848.
Keim, Geo. M. (N.R.), July, 1852.
*Keating, Wm. V., M.D., Jan. 1853.
Kennicott, Robt. (corres., N.R.), April, 1858.
Kimber, Thos., Jr., April, 1858.

Kneeland, Saml., Jr , M.D., May, 1858.
Kitchen, John S., M.D., June, 1858.
Krider, John, March, 1859.
Kane, John K., M.D. (N.R.), April, 1859.
Kendall, Prof. E. Otis, March, 1860.
Kingsbury, Chas. A., M.D., March, 1860.
Knight, J. Frank, Feb. 1863.
King, Wm. S., M.D., July, 1863.
King, Wm. M., M.D., Oct. 1863.
Keffer, Fred. A., M.D., Nov. 1864.
Kinsman, Chas. W., Feb. 1865.
*Klett, Frederick, Dec. 1865.
*Keehmle, Wm. C., March, 1866.
Kenderdine, Robt. S., M.D., May, 1866.
Keen, Wm., Jr., M.D., April, 1867.
*Knight, Edw. C., May, 1867.
*Kennedy, Elias D., Aug. 1867.

*Lukens, Isaiah, June, 1812.
Le Conte, John (corres.), Feb. 1815.
Lea, John, May, 1815.
*Lea, Isaac, LL.D., June, 1815.
Longstreth, Joshua, June, 1815.
*Lesueur, Chs. A., Jan. 1818.
Land, John (N.R.), May, 1836.
*Le Conte, J. L., M.D. (corres.) Feb. 1845.
*Leidy, Joseph, M.D., July, 1845.
*Lewis, Elisha J., M.D., July, 1846.
*Lambert, John, Nov. 1846.
*Lea, M. Carey, Sept. 1847.
*Lennig, Chas., Oct. 1847.
*Ludlow, John L., M.D , Nov. 1847.
Lejée, Wm. R., Feb. 1848.
*Lea, H. C., Feb. 1848.
*Lewis, Francis W., M.D., Oct. 1849.
*Lennig, Francis, July, 1851.
Langstroth, Rev. L. L. (N.R.), Sept. 1851.
*Lea, Joseph, June, 1852.
*Logan, J. Dickinson, M.D., Mar. 1853.
Lang, Edmund, M.D., April, 1853.
*Lea, Thos. T., May, 1853.
*Lewis, A. J., May, 1853.
*Lovering, Joseph S., May, 1853.
Lippincott, Joshua B., June, 1853.
Lesley, J. P., June, 1853.
Luther, Diller, M.D. (N.R.), Oct. 1854.
La Roche, C. Percy, M.D., Oct. 1855.
Lewis, Samuel, M.D., Oct. 1855.
Lamborn, R. H., May, 1857.
Lowber, Wm., M.D., June, 1858.
Letterman, Jon. C., M.D. (N.R.), Jan. 1859.
Littell, Emlen T., Jan. 1859.
Lesley, Joseph, Jr., March, 1859.
*Lewis, Saunders, March, 1859.
Lippincott, Joshua, April, 1859.
*Longstreth, Wm. W., Feb. 1860.
Lewis, Joseph S., Jan. 1861.
Leypoldt, F. (N.R.), March, 1862.
Lorenz, W. (N.R.), Feb. 1863.
*Lewis, Geo. T., Dec. 1863.
Lyman, Benj. Smith, Aug. 1865.
*Little, Amos R., March, 1866.
*Lewis, Chas. S., April, 1866.
Leeds, Albert R., Dec. 1866.
Levick, James, M.D., Jan. 1867.
*Lovering, Jos. S. Jr., Feb. 1867.
*Livezey, John, Feb. 1867.
*Long, Mrs. E. P., March, 1867.
*Little, James H., April, 1867.
Langdon, T. Brantley, July, 1867.
Leeds, Josiah W., Dec. 1867.

*Mann, C. M. (founder), Jan. 1812.
*Maclure, Wm., July, 1812.
*M'Euen, Thos., M.D., May, 1818.
*Morton, Saml. Geo., M.D., April, 1820.
*Mitchell, John K., M D., July, 1822.
Mickle, Andrew E., M.D., June, 1831.
Mütter, Thos. D., M.D., July, 1833.
M'Euen, Chas., Dec. 1834.
Mifflin, Geo., March, 1835.
Miller, Clement S., Dec. 1836.
*Markland, John H., May, 1839.
*Maclure, Alexander, Dec. 1840.
Moss, Theo. F., June, 1845.
M'Call, Gen. G. A. (corres.), June, 1847.
M'Clellan, J. H. B., M.D., Nov. 1847.
M'Michael, Wm., June, 1850.
*Meigs, J. Forsyth, M.D., April. 1852.
*Morris, Jacob G., April, 1852.
*Meigs, Jas. Aitken, M.D., April, 1852.
*Mercer, Singleton A., May, 1853.
*Merrick, Saml. V., May, 1853.
*Myers, John B., May, 1853.

Mitchell, S. Weir, M.D., Sept. 1853.
Merrick, J. Vaughan, April, 1854.
Messchert, M. H., June, 1854.
*Morris, J. Cheston, M.D., Oct. 1854.
**Moore, Saml.*, M.D., Nov. 1855.
M'Allister, John, Jr., June, 1856.
Monnier, Alfred (N.R.), Aug. 1856.
Morton, Thos. Geo., M.D., Aug. 1856.
Morehouse, Geo. R., M.D., Aug. 1856.
Marsh, Benj. V., April, 1857.
McGuire, Jas. C. (N.R.), April, 1857.
*Martin, Geo., M.D., April, 1857.
Minturn, Edw., M.D., Oct. 1857.
McClune, Jas., Jan. 1858.
McAllister, Wm. Y., Feb. 1858.
McEuen, Chas. Izard, June, 1858.
McCanles, John, April, 1859.
Maguire, Nicholas H., July, 1859.
**Morris, Miss Margaretta H.*, Sept. 1859.
*Mactier, Wm. L., Jan. 1860.
*Meehan, Thos., March, 1860.
Moore, Francis, M.D., May, 1860.
*Mordecai, Edw. R., M.D.(N.R.)May, 1860.
Mitchell, Edw. Craig (N.R.), July, 1860.
*Morris, Henry, March, 1862.
Miller, E. Spencer, May, 1862.
Martindale, Jos. C., M.D., Jan. 1863.
Milliken, Jas., March, 1863.
Maisch, John M., March, 1864.
McCreary, J. B., May, 1865.
*Meade, Maj. Gen. Geo. C., July, 1865.
McQuillen, J. H., M.D., Oct. 1865.
Maris, John M., Oct. 1865.
Mackenzie, R. Shelton, March, 1866.
Moore, J. G., July, 1866.
Mayburry, Wm., M.D., Oct. 1866.
**Marshall, Richard M.*, Feb. 1867.
*Marshall, Benj., Feb. 1867.
**Morton, Samuel C.*, March, 1867.
*Magarge, Charles, April, 1867.
*McKean, H. Pratt, April, 1867.
*Morris, Wistar, April, 1867.
*Morris, Israel, April, 1867.
*Morris, Theo. H., May, 1867.
*Moore, Andrew M., July, 1867.
Matthews, Chas. W. Oct. 1867.
Murphy, Edw. R., Nov. 1867.
*Moorhead, Wm. G., Dec. 1867.
*Magee, J. Ronaldson, Dec. 1867.
*Magee, Horace, Dec. 1867.

**Norris, Wm., Jr.*, Dec. 1830.
Neill, John, M.D., May, 1847.
**Norris, Octavus A.*, Oct., 1849.
Newbold, Thos., M.D. (N.R.), Nov. 1854.
Neff, Chas., M.D., April, 1858.
Norris, Geo. W., M.D., May, 1858.
*Norris, Wm. F., May, 1858.
*Norris, Thaddeus, May, 1858.
Norris, Isaac, M.D., Jan. 1861.
*Nebinger, A., M.D., July, 1866.
Nolan, Edw. J., M.D., April, 1867.
Newkirk, Matthew, Nov. 1867.

**Ord, George*, Sept. 1815.
Orne, Jas. H., Dec. 1865.
Ogden, C. G., July, 1866.

**Parmentier, N. S.* (founder), Jan. 1812.
**Pierce, Jacob*, (N.R.), Dec. 1813.
**Patterson, R. M.*, M.D., Jan. 1816.
*Peale, Titian R. (N.R.), Aug. 1817.
**Poulson, Chas. A.*, Sept. 1823.
**Pennock, C. W.*, M.D. (N.R.), June, 1824.
**Preston, Jonas*, M.D., Jan. 1825.
Penrose, Saml. S., Nov. 1830.
*Peterson, Robert E., April, 1831.
Porter, R. R., June, 1833.
Pearsall, Robt., Dec. 1835.
Phillips, John S., Aug. 1836.
Pepper, Wm., M.D., Feb. 1837.
Percival, Thomas C., Jan. 1845.
Powel, Saml. (N.R.), July, 1847.
*Pancoast, Jos., M D., Dec. 1847.
Phillips, D. B., M.D., Oct. 1852.
Page, Wm. Byrd, M.D., April, 1853.
**Pepper, Henry*, May, 1853.
**Price, Richard*, May, 1853.
**Platt, Wm.*, May, 1853.
Pennypacker, I. A., M.D., Sept. 1854.
Penrose, R. A. F., M.D., April, 1856.
Packard, John H., M.D., Nov. 1856.
Paul, Jas., M.D., March, 1857.
*Pepper, L. S., M.D., July, 1857.

Porter, Prof. E. D. (N.R.), Oct. 1857.
Parrish, Wm. D., May, 1859.
Powel, John Hare (N.R.), May, 1858.
Parker, Jos. E., M.D., July, 1858.
Peters, Francis, Jan. 1859.
Patterson, Francis E., Jan. 1859.
Peace, Edw., M.D., April, 1859.
Peterson, Geo. W., Aug. 1859.
*Pepper, Geo. S., July, 1860.
Potts, Wm. (N.R.), Nov. 1860.
Parrish, Edward, Dec. 1860.
Powel, Robt. Hare, May, 1862.
Porter, J. Hampden, M.D., Feb. 1863.
Parker, Chas. F., Aug. 1865.
Parrish, Jas. C, March, 1866.
Parker, John B., April, 1866.
*Patterson, Joseph, Feb. 1867.
Procter, Wm., Feb. 1867.
*Phillips, Moro, March, 1867.
*Page, Joseph F., April, 1867.
Pepper, W., M.D., Aug. 1867.
Pepper, Geo., M.D., Aug. 1867.
*Potter, Thomas, May, 1867.

Queen, Jas. W., Jan. 1858.

Rotch, Joseph, Feb. 1814.
Randolph, Richard, May, 1814.
Richardson, Caleb, Dec. 1814.
Rotch, Thomas, Feb. 1816.
Rafinesque, C. S., Feb. 1816.
Read, James, Dec. 1824.
Reeve, Mark M., M.D., March, 1831.
*Ruschenberger, W. S. W., M.D. (corres.), May, 1832.
Rogers, Henry D., (N.R.), Nov. 1834.
Ryan, Thomas, Jan. 1836.
Rogers, R.E., M.D., Feb. 1837.
*Redfield, John H., (corres.), Aug. 1846.
Rogers, James B., M.D., Oct. 1847.
*Rosengarten, Saml. G., May, 1850.
Remington, R. P., (N.R.), Nov. 1850.
*Rand, B. Howard, M. D, Jan. 1851.
*Remington, Thos. P., May, 1853.
Rogers, Fairman, Feb. 1854.
Rogers, W. Frederick, March, 1855.
Rush, Madison, June, 1855.
Rand, Theodore D., Sept. 1857.
Ryland, K., M.D., Dec. 1857.
Richardson, T. G., M.D., (N.R.) Jan. 1858.
Roberts, Solomon W., April, 1860.
Reece, Davis, (N.R.), Nov. 1860.
*Rice, John, April, 1861.
Rothrock, J. T., Dec. 1864.
Randolph, S. Emlen, Dec. 1865.
*Reakirt, Edwin L., Jan. 1866.
Reakirt, Tryon, April, 1866.
*Rhoads, Jos. R, May, 1866.
*Roberts, S. Raymond, June, 1866.
*Randolph, Evan, Feb. 1867.
Robb, Richard R., Feb. 1867.
*Rockhill, Daniel H., May, 1867.
Ralston, Rev. J. G., May, 1867.

Shinn, John, Jr., (founder), Jan. 1812.
Speakman, John (founder), Jan. 1812.
Say, Thomas (founder), April, 1812.
Stouse, Joseph, M D., May, 1812.
Say, Benjamin, June, 1813.
Stockton, E. B., May, 1815.
Smith, Charles W., Dec. 1815.
Smith, Jacob R., Dec. 1815.
Stewart, William, (N.R.), June, 1823.
Spackman, George, M.D., July, 1825.
*Smith, Joseph P., Feb. 1826.
*Seybert, Henry, M.D., Dec. 1826.
Steinhaur, Rev. Dan., July, 1829.
Smith, John B., April, 1834.
*Simmons, John (N.R.), July, 1835.
Shoemaker, Benj., (N.R.), Sept. 1835.
Snelling, Samuel, Aug. 1836.
*Say, Mrs. Lucy W., (N.R.), Oct. 1841.
Stephens, H. S., May, 1843.
Sargent, F. W., M.D. (N R.), Sept. 1847.
*Sergeant, J. Dickinson, Oct. 1847.
Smith, Francis G., M.D., Feb. 1849.
Smith, Aubrey H., Sept 1850.
*Smith, Charles E., June, 1851.
Sherman, W. L., M.D., Oct. 1851.
Sharpless, Caspar W., Jan. 1852.
Struthers, William, Feb. 1852.
*Seal, Thomas F., (N.R.), May, 1852.
*Sheafer, P. W., (N.R.), March, 1853.
*Schafhirt, Fred., (N.R.), March, 1853.

*Swift, Joseph, May, 1853.
*Sanderson, Ed. F., (N.R.), Sept. 1853.
Smyth, Samuel, (N.R), June, 1855.
*Spackman, Rev. H. S. (N.R.),July, 1855.
Smith, Alex. Hamilton, M.D., Dec. 1856.
Souder, Edmund A., Feb. 1857.
Scull, Gideon D., March, 1857.
Slack, John H., M.D. (N. R.), July, 1857.
Schmidt, Henry D., (N.R.),Feb. 1858.
*Sommerville, Jas. M., M.D., Feb. 1858.
Stimpson, Wm., (N.R.), April, 1858.
Stephens, Lemuel, May, 1858.
Stewart, Wm. H., (N.R.), Oct. 1858.
Shoemaker, Benj. H., Oct. 1858.
Swann, Wilson C., M.D., Feb. 1859.
*Stewardson, Thomas, M.D., April, 1859.
Smith, Henry H., M.D., April, 1859.
Seitzinger, F. S., April, 1859.
*Sparks, Thomas, May, 1859.
*Smith, Thomas, June, 1859.
Schell, Henry S., M.D., July, 1859.
*Schaffer, Chas., M.D., March, 1861.
Scattergood, Thos., Jr., Nov. 1862.
Smith, A. K., M.D., Nov. 1862.
Smith, Andrew H., M.D., Jan. 1863.
Saurman, Benj. F., M.D., Jan. 1863.
Steele, J. Dutton, (N.R.), Feb. 1863.
Scattergood, Geo. J., Aug. 1863.
Smith, Richard S., Feb. 1864.
Smith, Thos. Guilford, Jan. 1866.
Stelwagen, Thos. C., D.D.S., March, 1866.
*Slaymaker, Samuel E., March, 1866.
Shipley, Samuel R., April, 1866.
Sellers, Wm., April, 1866.
Stille, Henry, M.D., May, 1866.
Shober, Sam. L , July, 1866.
Sellers, Coleman, Dec. 1866.
*Shively, Geo. S., M.D., Dec. 1866.
Stevens, W. H., Jan. 1867.
*Smith, Walter B., Jan. 1867.
Stetler, John G., M.D., Feb. 1867.
*Smith, Charles, March, 1867.
Snowden, J. Ross, April, 1867.
*Spencer, Charles, April, 1867.
*Scott, Thomas A., April, 1867.
*Sloan, Andrew W., May, 1867.
Shoemaker, Geo. Y., Nov. 1867.
Smith, Lloyd P., Nov. 1867.
Sheppard, Edwin, Dec. 1867.
Silliman, Henry R., M.D., 1867.

Troost, Gerard, M.D. (founder), Jan. 1812.
*Thompson, J. Edgar, Feb. 1831.
Tuft, John B., M.D., (N.R.), May, 1831.
**Taylor, Rich. C.*, (corres.), July, 1832.
**Townsend, John K.*, M.D., Sept. 1833.
Turnpenny, Frederick, M.D., Nov. 1833.
Trudeau, James, M.D. (N.R.), Nov. 1835.
*Trautwine, John C., April, 1852.
Taggart, Wm. H., M.D., April, 1853.
Turner, Thos. J., M. D., Feb. 1854.
Tyson, Job R., May, 1854.
Tiedeman, Henry, M.D., July, 1855.
Taylor, William J., Feb. 1857.
Turnbull, W. P., July, 1857.
Tompkins, Myron, M.D., May, 1858.
*Tryon, Geo. W., Jr., June, 1859.
Townsend, Washington, Oct. 1859.
Torr, Wm. S., Oct. 1860.
Thompson, Edgar L., Nov. 1860.
Turner, J. Paul, M.D., April, 1864.
Thompson, Jas. C., Feb. 1865.
Trotter, Newbold H., Dec. 1865.
Taylor, Alfred B., Dec. 1865.
*Turner, John, March, 1866.
*Thomas, Joseph, M.D., April, 1866.
Tryon, Edw. K., Jr., April, 1866.
Taylor, T. Clarkson, (N.R.), May, 1866.
*Turnpenny, Jos. C., Dec. 1866.
*Taylor, Charles, March, 1867.
*Tyler, Geo. F., April, 1867.
*Trevor, John B., (N.R.), May, 1867.
*Taitt, John T., May, 1867.
Tyson, J. K., M.D., Aug., 1867.
Thomas, Chas. H., M.D., Sept., 1867.

Uhler, Wm. H., M.D., Jan. 1856.
Uhler, Philip R., (N.R.), March, 1858.
Ulke, Henry, (N.R.), April, 1858.

Vanuxem, Lardner, June, 1815.
**Vaux, Roberts*, March, 1818.
**Vaughan, John*, March, 1822.
*Vaux, William S., March, 1834.
Vanderkemp, John J., M.D., April, 1854.
Vail, Hugh D., Nov. 1860.

Vandyke, E. B., M.D., Sept. 1866.
*Vaux, George, Dec. 1866.
*Vaux, Mrs. E. H., Feb'y, 1867.

Wilson, Alexander, June, 1813.
Warner, Benjamin, Feb. 1814.
Waterhouse, John F., M.D., March, 1814.
* *Warder, William S.*, Dec. 1814.
*Wagner, William, June, 1815.
Woollens, Jos., M.D., June, 1815.
* *Watson, Joseph*, May, 1816.
* *Wetherill, J. Price*, March, 1817.
* *Wagner, Tobias*, Oct. 1818.
*Williams, Henry J., April, 1819.
*Wetherill, William, Feb. 1824.
Wood, Wm. W. (N.R.), Jan. 1825.
*Wood, Geo. B., M.D., Feb. 1825.
Ware, Nathaniel A. (N.R.), Oct. 1826.
* *Wetherill, Charles*. Nov. 1830.
* *Wistar, Richard*, Jan. 1831.
* *Wilson, Thos. B.*, M.D., June, 1832.
Walker, A. M. (N.R.), April, 1836.
Whelpley, James D. (N.R.), Mar. 1838.
Wistar, Mifflin, M.D., June, 1839.
Watson, Gavin, M.D., April, 1840.
Wetherill, Samuel, (N.R.), Nov. 1843.
Woodhouse, Sam. W., M.D., Nov. 1845.
*Wetherill, Chs.M., M.D., (N.R.), Feb. 1846.
Whitman, Wm. E., Feb. 1848.
Wolgamuth, Francis F., Feb. 1848.
*Wilson, Wm. S., June, 1848.
*Wheatley, Chs. M., March, 1850.
*Wister, Caspar, M. D., June, 1851.
*Welsh, William, May, 1853.
*Wood, Richard D., May, 1853.
*Whelen, Edward S., June, 1853.
Wythes, Rev. Jos. H. (N.R.), Nov. 1853.
Woodward, J. J., M.D., June, 1855.
West, Hilborne, M.D., Sept. 1855.
Wilson, Joseph, M.D., Jan. 1856.
*Weightman, Wm., Sept. 1856.
Warren, Gen. G. K., (N.R.), Feb. 1857.
Wilcocks, Alex., M.D., April, 1857.
Warren, David March, May, 1857.
Wurts, C. S., M.D., July, 1857.
Wharton, Henry, Feb. 1858.
Wayne, Henry C., Feb. 1858.
Wilson, Pierce B., (N.R.), Oct. 1858.
Wilson, Samuel W., M.D., Dec. 1858.
*Whitney, Jas. S., Dec. 1858.
Williams, Samuel H., May, 1859.
Wister, Owen J., M.D., June, 1859.
White, John D., M.D., Oct. 1859.
*White, S. S., D.D.S., Nov. 1859.
*Welsh, John, Dec. 1859.
*Wilstach, Wm. P., July, 1860.
Wood, Richard, Sept. 1860.
*Warner, John, (N.R.), Dec. 1860.
*Wood Geo. K., M.D., (N.R.), Jan. 1862.
*Wells, W. Lehmann, M.D., June, 1863.
*Wood, Horatio C., Jr., M.D., June, 1864.
*Wharton, Joseph, July, 1864.
*Warner, Redwood F., Dec. 1864.
*Winsor, Henry, Aug. 1865.
Wood, John B., Sept. 1865.
Woodward, Geo. M., Jan. 1866.
*White, Wm. R., Feb. 1866.
*Wood, Edw. R., Feb. 1866.
Westcott, Charles S., March, 1866.
Webber, R. L., M.D., April, 1866.
Walton, Joseph, April, 1866.
Wyeth, Frank H., Sept. 1866.
*Welsh, Samuel, March, 1867.
*Williamson, I. V., April, 1867.
*Wheeler, Charles, April, 1867.
*Whitney, Asa, May, 1867.
*Whitney, George, May, 1867.
*Whitney, John R., May, 1867.
*Whelen, Jas. N., May, 1867.
*Whelen, Wm. A., May, 1867.
*Whilldin, Alex., May, 1867.
*White, Wm. R., Jr., May, 1867.
Wilson, Franklin S., May, 1867.
*Wright, Jos. A., May, 1867.
*Waln, S. Morris, June, 1867.
Willcox, Joseph, Dec. 1867.
*Waterman, Isaac S., Dec. 1867.

*Xantus, John Louis (de Vésey), (N.R.), Dec. 1856.
Yarrow, Harry C., M.D., May, 1863.

Zantzinger, George, Sept. 1835.
*Zantzinger, Wm. S., M.D. (N.R.) Oct. 1840.
Ziegler, George J., M.D., Nov. 1856.

CORRESPONDENTS.

Adrian Robert, LL.D., 1815.
Abadie, Pedro, Lima, Pern, 1821.
Audouin, J. Victor, M.D., Paris, 1821.
Audubon, John James, New York, 1831.
Anthony, John Gould, Cambridge, Mass., 1833.
Agardh, Professor C. A., Lund, Sweden, 1834.
Auber, Pedro Allessandro, 1835.
Abadie, E. H., M.D. U. S. A., 1836.
Agassiz, Professor Louis, Cambridge, Mass., 1836.
Anton, Professor Frak., Hallé, Germany, 1840.
Alger, Francis, Boston, 1841.
Arago, M., Paris, 1843.
Avogadro, Amedeo, Turin, 1844.
Audubon, Victor G., New York, 1845.
Adams, Charles B., Amherst, Mass., 1846.
Aall, Nicolai, Christiana, Sweden, 1846.
Antisell, Thomas, M.D., New York, 1852.
Audubon, John W., New York, 1854.
Adamson, J. C., M. D., 1856.
Agassiz, Alex., Cambridge, Mass., 1864.
Anderson, Rev. M. B., LL. D., Rochester, New York, 1866.
Adams, Rev. E. E., Oxford, Delaware County, Pennsylvania, 1867.
Adams, Henry, London, 1867.
Adams, Arthur, London, 1867.
Angas, George French, Port Jackson, 1867.

Bartram, William, Kingsessing, Pennsylvania, 1812.
Bedwell, Thomas, Jr., Rio Janeiro, 1812.
Beelen, A., Pittsburg, Pa., 1812.
Brongniart, Alexandre, Paris, 1812.
Bruce, Archibald, M.D., New York, 1812.
Betton, Samuel, M.D., Germantown, 1815.
Beck, T. Romeyn, M.D., Albany, New York, 1816.
Bickley, Robert, Pennsylvania, 1816.
Baldwin, William, M.D., Wilmington, Delaware, 1817.
Blainville, H. Ducrotay De, Paris, 1817.
Bradbury, John, London, 1817.
Bonelli, Professor Francisco, Turin, 1818.
Brown, Samuel, M.D., Alabama, 1818.
Brantz, Lewis, Baltimore, Maryland, 1819.
Bigsby, John J., M.D., Newark-on-Trent, England, 1820.
Beudant, F. S., Paris, 1821.

Borie, A. Amicus, Paris, 1821.
Brongniart, Adolph T., M.D., Paris, 1821.
Brewster, David, LL.D., Edinburgh, 1822.
Buckland, Rev. William, D.D., Oxford, England.
Best, Robert, Lexington, Kentucky, 1823.
Bellingeri, M. Turin, Italy, 1826.
Berzelius, Professor J. Jacob, Stockholm, 1826.
Burr, John H. M.D., Chiloe, Chili, 1829.
Bustamente, Jose Maria, Mexico, 1828.
Boué, Ami, Paris, 1830.
Barabino, Joseph, New Orleans, 1831.
Blanding, William, M.D., Providence, R. I., 1831.
Beche, Sir Henry Thomas de la, London, 1832.
Bachman, Rev. John, D.D., Charleston, South Carolina, 1832.
Beaumont, Elie De, Paris, 1833.
Beck, Lewis C., New Brunswick, New Jersey, 1833.
Bell, Thomas, London, 1834.
Burchell, William J., London, 1835.
Belot, Jule Henri, Paris, 1836.
Binney, Amos, M.D., Boston, 1836.
Blanding, Shubel, M.D., South Carolina, 1836.
Blanding, William, South Carolina, 1836.
Broderip, William J., London, 1836.
Brown, Benjamin B., St. Louis, Missouri, 1837.
Barratt, Joseph, LL. D., Middleton, Connecticut, 1837.
Backman, Professor Charles Frederick, Jena, Germany, 1840.
Bailey, Professor J. W., West Point, 1841.
Brewer, Thomas M., M.D., Boston, 1841.
Balfour, J. Hutton, M.D., Glasgow, Scotland, 1842.
Bourne, W. Oland, New York, 1844.
Boudin, J. C. M., M.D., Versailles, France, 1845.
Bey, Clot, M.D., Cairo, Egypt, 1845.
Baird, W. M., Reading, Pennsylvania, 1846.
Brown, Richard, Sidney, Cape Breton, 1846.
Bromfield, William A., M.D., Isle of Wight, 1847.
Brevoort, James Carson, Brooklyn, New York, 1847.
Barratt, John P., M.D., Barrattsville, South Carolina, 1847.
Brydges, Sir Harford J. J., Bart, England, 1848.
Blyth, Edward, Calcutta, 1848.
Blanchard, M. Emile, Paris, 1848.
Bartlett, John R., New York, 1850.
Barry, Rev. A. C., Racine, Wisconsin, 1853.
Buch Leopold von, Berlin, 1840.
Burnett, Waldo J., M.D., Boston, 1854.
Brücke, Professor E., Vienna, 1854.
Blake, W. P., Oakland, Ct., 1856.
Bland, Thomas, New York, 1858.

Beneké, Professor F. W., M.D., Hesse Cassel, 1858.
Barrande, Joachim, Prague, 1859.
Bunbury, Charles J. F., London, 1859.
Bernardi, Chev. A. C., Paris, 1860.
Booth, Francis, M.D., London, 1862.
Beebe, Edw. H., Galena, Ill., 1863.
Boivin, Am., Paris, 1864.
Brunet, Rev. Ovide, Quebec, 1865.
Blake, Rev. Joseph, Gilmanton, New Hampshire, 1866.
Baxter, Dr. J. H., U. S. A., Washington, D. C., 1866.
Berthoud, E. S., Boulder City, Colorado, 1866.
Buck, Charles Elton, New York, 1866.
Brewer, Wm. H., New Haven, Conn., 1867.
Bourguignat, M. J. R., Paris, 1867.
Benson, H., Cheltenham, Eng., 1867.
Baudon, Auguste, M.D., Bauvais, France, 1867.
Benoit, Luigi, Messina, 1867.
Busch, G. von dem, M.D., Bremen, 1867.

Cooper, Thomas, M.D., LL.D., Columbia, South Carolina, 1812.
Cleveland, Parker, LL. D., Bowdoin College, Maine, 1812.
Chapman, Isaac, M.D., Bucks County, Pennsylvania, 1813.
Clinton, De Witt, LL.D., New York, 1815.
Carr, Robert, Kingsessing, Pennsylvania, 1816.
Cist, Jacob, Wilkesbarre, Pennsylvania, 1816.
Clifford, John D., Lexington, Kentucky, 1816.
Cogswell, Joseph H., New York, 1816.
Cloquet, Jules, Paris, 1816.
Collins, Baron de, Havana, Cuba, 1818.
Cuvier, Baron George, Paris, 1818.
Cloquet, Jules (le jeune), Paris, 1819.
Camper, Adrain, Holland, 1821.
Colla, Professor Luigi, Turin, 1822.
Cooper, William, New York, 1828.
Cass, Lewis, Detroit, 1831.
Craft, James S., Pittsburg, Pennsylvania, 1831.
Cohen, J. J., M.D., Baltimore, Maryland, 1833.
Casanova, J. S., M.D., Paris, 1834.
Cramer, Charles, St. Petersburg, Russia, 1834.
Croom, H. P., Tallahasse, Florida, 1835.
Cautley, Major Proby T., London, 1836.
Children, J. G., London, 1836.
Conybeare, William D., London, 1836.
Curtis, John, London, 1836.
Carus, Professor Charles G., M.D., Dresden, 1837.
Clapp, Asahel, M.D., New Albany, Indiana, 1837.
Clark, Lewis Meriwether, St. Louis, Missouri, 1837.

Couthouy, Joseph P., Boston, 1837.
Combe, George, Edinburgh, 1838.
Clay, J. Randolph, 1839.
Carpenter, Wm. M., M.D., Louisiana, 1840.
Charlesworth, Edward, London, 1841.
Couper, J. Hamilton, Darien, Georgia, 1842.
Conyngham, Redmond, Lancaster County, Pennsylvania, 1842.
Chevreul, E., Paris, 1845.
Chipman, Isaac L., Horton, Nova Scotia, 1847.
Cantor, Theodore, M.D., Singapore, India, 1848.
Cobb, J., M.D., Kentucky, 1848.
Couch, D. N., U. S. A., 1853.
Campbell, H. Frazer, M. D., Augusta, Georgia, 1858.
Carbonell, Celedonio, Porto Rico, 1859.
Clemens, Brackenridge, M.D., Easton, Pa., 1859.
Claparede, Edw., Geneva, 1859.
Carpenter, Wm. B., M.D., London, 1860.
Cornay, J. C., Paris, 1861.
Chapman, A. W., M.D., Florida, 1861.
Coues, Elliott, M. D., U. S. Army, Washington, D. C., 1861.
Cowan, Hon. Edgar, Pennsylvania, 1861.
Carpenter, P. P., New Montreal, C. E., 1862.
Chittenden, Hon. L. E., New York, 1863.
Craven, J. J., M.D., U. S. A., 1863.
Capillini, Giovanni, Bologna, 1863.
Clinton, Geo. W., Buffalo, 1866.
Collier, D. C., Central City, Colorado, 1866.
Credman, Herman, New York, 1866.
Carter, Samuel R., Paris Hill, Oxford County, Maine, 1866.
Caligny, M. Le Mis de, France, 1866.
Cowan, Frank, Washington City, 1866.
Crosse, H. M., Paris, 1867.
Chenu, J. C., Paris, 1867.
Chitty, Hon. Edw., Kingston, Jamaica, 1867.
Caillaud, Fred., Nantes, 1867.
Cooper. J. G., M.D., San Francisco, Cal., 1867.
Cox, J. C., Sydney, New South Wales, 1867.
Cavada, F. F., U. S. Consul, Trinidad, 1867.

Davis, John, Boston, 1812.
Doddridge, C., M.D., Brook C. H., Virginia, 1812.
Drake, Daniel, M.D., Cincinnati, Ohio, 1812.
Ducatel, Julius F., M.D., Baltimore, Maryland, 1812.
Dana, Samuel L., Cambridge, Massachusetts, 1815.
Dillwyn, Lewis W., Pennllergare, Wales, 1815.
Duncan, Thomas, Rappahannock, Virginia, 1816.
Desmarest, Anselme Gaetan, Paris, 1817.

Darlington, William, M.D., West Chester, Pennsylvania, 1818.
Duméril, Constant, Paris, 1818.
Duvignan, M., Paris, 1820.
Dekay, James E., M.D., New York, 1821.
Dupont, Alfred, Wilmington, Delaware, 1821.
De Rivero, Mariano, Arequipa, Peru, 1821.
Deabbate, Gaspard, Turin, 1823.
Drapier, A., Brussels, 1824.
Doebereiner, Professor Johannes W., Jena, Austria, 1830.
Deshayes, G. P., Paris, 1832.
Dewey, Rev. Chester, Rochester, N. Y., 1832.
Duclos, M., Paris, 1833.
D'Orbigny, M. Alcide, Paris, 1834.
Dana, James D., New Haven, Connecticut, 1836.
De Candolle, Auguste P., Geneva, 1836.
Draper, John W., M.D., New York, 1836.
Dietz, Andrew R., St. Thomas, West Indies, 1839.
Denny, Henry, Leeds, England, 1842.
Delafield, Major Joseph, New York, 1846.
Dawson, J. W., Pictou, Nova Scotia, 1846.
Davis, Edwin Hamilton, M.D., Chilicothe, Ohio, 1847.
Dowler, Bennet, M.D., New Orleans, 1848.
Doane, George W., D.D., New Jersey, 1848.
Dewey, Henry B., Para, Brazil, 1850.
Diesing, C. M., M.D., Vienna, Austria, 1851.
Daniel, Wm. F., M.D., London, 1852.
Dalton, Henry G., M.D., Demarara, 1852.
De Candolle, Alphonse, Geneva, 1853.
Dearing, W. E., M.D., Augusta, Georgia, 1854.
Dalton, John C. W., M.D., New York, 1854.
D'Oleveira, D. Baptista, Rio de Janerio, 1855.
Doremus, R. Ogden, M.D., New York, 1855.
Davis, J. Bernard, England, 1856.
Desmoulins, Chas., Bordeaux, 1859.
Dunker, Professor Wm., Marburg, Cassel, 1859.
De Camp, Wm. H., M.D., Grand Rapids, Mich., 1859.
Darwin, Chas., F.R.S., F.G.S., London, 1860.
Decaisne, Prof. Jos., Paris, 1862.
Dean, John, M.D., Boston, 1862.
Davis, Hon. Henry Winter, Baltimore, 1863.
Durieu de Maisonneuve, Prof., Bordeaux, 1865.
Du Bois, Prof. Alfred, Laurette, Park Co., Colorado, 1866.
Dresser, H. E., London, 1867.
Drouet, Henri, Troyes, 1867.
Do Castello de Paiva, Baron, Lisbon, 1867.
Durham, Geo. J., Austin, Texas, 1867.

Elliott, Andrew, Pennsylvania, 1812.
Escher, Henri, Switzerland, 1813.
Elliott, Stephen, Charleston, S. C., 1815.
Eandi, Chev. A. M., Vassali, Turin, 1822.
Ellis, W. Cox, Muncy, Pennsylvania, 1828.
Eaton, Amos, Troy, New York, 1829.
Eaton, H. Hulbert, M.D., Lexington, Kentucky, 1831.
Edwards, M. Milne, Paris, 1832
Earle, John Milton, Worcester, Massachusetts, 1833.
Esenbeck, Professor C. G. Nees Von, Bonn, 1836.
Eights, James, M.D., Albany, New York, 1837.
Emmons, Ebenezer, M.D., Albany, New York, 1840.
Engelmann, George, M.D., St. Louis, Missouri, 1840.
Emerson, George B., Boston, 1840.
Ryton, Thomas C., Shropshire, England, 1846.
Eschricht Professor Daniel F., M.D., Copenhagen, 1848.
Ehrenberg, Christian G., M.D., Berlin, 1848.
Evans, John, M D., New Harmony, Indiana, 1850.
Enderlin, Charles, M.D., New York, 1854.
Elliott, Rev. Stephen, Savannah, Georgia, 1856.
Ettingshausen, Constantine Von, 1859.
Edwards, Wm. H., New York, 1861.

Fonds, M. Faujas de St., Paris, 1812.
Faucker, Sylvanus, Connecticut, 1815.
Ferris, Z., Wilmington, Delaware, 1815.
Forster, Thomas, M.D., London, 1816.
Francis, John W., M.D., New York, 1816.
Férussac, Baron d'Audebard de, Paris, 1816.
Fowler, Samuel, M.D., Franklin, New Jersey, 1823.
Foote, John P., Cincinnati, Ohio, 1824.
Featherstonhaugh, G. W., Havre, 1830.
Frick, Henry, Northumberland, Pennsylvania, 1831.
Fitzinger, Professor Leopold, Vienna, 1832.
Falconer, Hugh, M.D., London, 1836.
Fitton, William Henry, M.D., London, 1837.
Fussel, Edwin, M.D., Indianapolis, Indiana, 1840.
Faraday, Sir Michael, London, 1847.
Fremont, John Charles, 1848.
Foster, J. W., Lake Superior, 1852.
Ford, Henry A., Glasstown, Gaboon River, Liberia, 1852.
Fox, Rev. Charles, Michigan, 1853.
Frauenfeld, Geo. Ritter von, Vienna, 1859.
Flourens, P., Paris, 1859.
French, Wm. H., White Haven, Luzerne Co., Pa., 1866.
Fischer, Paul, M.D., Paris, 1867.

Griscom, John, LL.D., Burlington, New Jersey, 1814.
Gibbs, George, New York, 1815.
Gilmer, Francis W., Albemarle County, Virginia, 1815.
Griffith, Thomas, M.D., Columbia, Pennsylvania, 1815.
Gorham, John, M.D., Harvard University, 1816.
Gummere, John, Burlington, New Jersey, 1816.
Garcia, Manuel de la, Madrid, 1817.
Guillemard, John, London, 1817.
Gilmore, Robert, Baltimore, Maryland, 1819.
Gray, John Edward, LL.D., London, 1823.
Germar, Professor Ernst Freidrich, Halle, Saxony, 1828.
Griffith, Edward, London, 1828.
Galbraith, John, Venango, Pennsylvania, 1831.
Green, Benjamin D., M.D., Boston, 1831.
Geddings, E., M.D., Charleston, South Carolina, 1832.
Goldfuss, Professor August, M.D., Bonn, Germany, 1832.
Grateloup, M., M.D., Bordeaux, 1836.
Gray, Asa, M.D., Cambridge, Massachusetts, 1836.
Goheen, S. M. E., M.D., Columbia, Pennsylvania, 1840.
Gesner, Abraham, M.D., St. Johns, New Brunswick, 1840.
Gould, Augustus A., M.D., Boston, 1840.
Graham, Colonel J. D., U. S. Topog. Eng., 1841.
Gliddon, George R., 1841.
Galeotti, Henry, Brussels, 1842.
Giraud, Jacob P., Jr., New York, 1842.
Gould, John, London, 1843.
Gibbes, Lewis, R., M.D., Charleston, South Carolina, 1844.
Gibbes, Robert W., M.D., Columbia, South Carolina, 1845.
Gourlie, William, Jr., Glasgow, 1846.
Gerolt, Baron Von, Washington, 1846.
Gray, George Robert, London, 1846.
Gilliss, J. M, U.S.N., Washington City, 1848.
Goodsir, John D., Edinburgh, 1849.
Girard, Charles, M.D., Paris, 1851.
Garcia, Jose Ant., G. y, Lima, Peru, 1855.
Green, John W., M.D., New York, 1856.
Guyot, Professor Arnold, Princeton, N. J., 1858.
Gill, Prof. Theodore, Washington, D. C., 1860.
Guérin, Méneville F. E., Paris, 1861.
Gay, Jacques, Paris, 1862.
Grant, Jas. A., M.D., Canada, 1863.
Grote, Augustus R., New York, 1865.
Gray, Robert, Glasgow, Scotland, 1866.
Gray, C. C., M.D., U. S. A., 1866.
Gaussoin, Eugene, Baltimore, Maryland, 1867.
Gassies, J. B., Bordeaux, 1867.
Gundlach, J., M. D., Havana, 1867.
Gurney, John Henry, Norfolk, England, 1867.

Hauy, L'Abbé, Paris, 1812.
Haines, John S., Northumberland, Pennsylvania, 1814.
Hayden, Horace H., Baltimore, Maryland, 1815.
Hosack, David, M.D., New York, 1815.
Hunt, David, M.D., Northampton, Massachusetts, 1815.
Hassenfratz, J. H., Paris, 1819.
Hazlewood, George, London, 1821.
Hooker, Sir William Jackson, London, 1821.
Harris, Thaddeus W., M.D., Milton, Massachusetts, 1826.
Holmes, Ezekiel, M.D., Waterville College, Maine, 1826.
Horsfield, Thomas, M.D., London, 1826.
Hadley, James, M.D., Fairfield, New York, 1828.
Hildreth, Samuel P., M.D., Marietta, Ohio, 1832.
Hitchcock, Edward, LL.D., Amherst, Massachusetts, 1832.
Holbrook, John Edwards, M.D., Charleston, South Carolina, 1832.
Hurry, William Cobb, Calcutta, 1832.
Hooper, Robert, M.D., London, 1834.
Herrick, Edward C., New Haven, 1836.
Hodgkin, Thomas, M.D., London, 1837.
Henderson, Joseph, M.D , Mifflin County, Pennsylvania, 1838.
Houghton, Douglass, M.D., Detroit, 1840.
Hubbard, Oliver P., M.D., Dartmouth College, New Hampshire, 1841.
Henry, Joseph, LL.D., Washington City, 1843.
Herbert, Rev. William, LL.D., Manchester, England, 1843.
Hodgson, W. B., Savannah, Georgia, 1843.
Hall, James, Albany, New York, 1843.
Humboldt, Baron Alexander Von, Berlin, 1843.
Hayes, John Lord, Portsmouth, New Hampshire, 1844.
Haight, Richard K., New York, 1844.
Harden, John M. B., M.D., Liberty County, Georgia, 1846.
Hammond, Ogden, Charleston, South Carolina, 1847,
Herschel, Sir J. F. W., Bart., London, 1847.
Holmes, Francis S., Charleston, South Carolina, 1848.
Henry, T. Charlton, M.D., U.S.A., 1850.
Haidinger, W. C., Vienna, 1851.
Hyrtl, Professor Joseph, Vienna, 1851.
Hough, Franklin B., M.D., Somerville, New York, 1851.
Hauer, Baron von, Vienna, 1851.
Hartlaub, G., M.D., Bremen, 1852.
Hoy, Philo R., M.D., Racine, Wisconsin, 1853.
Hammond, W. A., M.D., New York, 1853.
Hartman, W. D., M.D., Westchester, Pennsylvania, 1853.
Harney, Wm. S., U.S.A., 1857.
Heer, Prof. Oswald, Zurich, 1859.
Hornes, Morris, M.D., Vienna, 1859.
Hamilton, W. J., London, 1859.
Huxley, Prof. T. H., F.R.S., London, 1859.

Hamlin, Dr. A. C., Bangor, Me., 1864.
Hyatt, Alpheus, Salem, Mass., 1867.
Hanley, Sylvanus, London, 1867.
Hidalgo, J. Gonzales, Madrid, 1867.

Ives, Ansel W., M.D., New York, 1817.

Jackson, William, Chester County, Pennsylvania, 1814.
James, William, Halifax, Virginia, 1816.
Jansen, Joseph, London, 1816.
Jones, William, Calcutta, 1817.
Jefferson, Thomas, LL.D., Virginia, 1818.
Jussieu, Antoine Laurent de, Paris, 1818.
Jameson, Robert, Edinburgh, 1822.
James, Edwin, M.D., U.S.A., 1823.
Jackson, Charles T., M.D., Boston, Massachusetts, 1833.
Jay, John C., M.D., Mamaroneck, West Chester Co., N. Y., 1835.
Jameson, William, M.D., Quito, Ecuador, 1836.
Jenkins, John Carmichael, M.D., Miss., 1836.
Jarvis, Rev. T. Farmer, D.D., Middletown, Connecticut, 1837.
Jones, John Coffin, California, 1838.
Johnston, James F. W., Durham, England, 1838.
Johnson, Wesley, M.D., Liberia, Africa, 1841.
Johnston, George, M.D., Berwick-on Tweed, 1841.
Johnston, John, Middletown, Connecticut, 1843.
Jackson, J. B. S., M.D., Boston, Massachusetts, 1846.
Jackson, Robert M. S., M.D, Indiana County, Pennsylvania, 1848.
Jones, William L., M.D., Riceboro, Georgia, 1848.
Jardien, Ambrose, Paris, 1851.
Jolis, Auguste le, Cherbourg, France, 1858.
Jones, Jos., M.D., Nashville, Tenn., 1858.
Jäger, Prof. Geo. F., Stuttgart, 1859.
Jones, Thos. Rymer, F.R.S., London, 1859.
Jones, Thos. Rupert, 1864.
Jeffreys, J. Gwynn, London, 1867.
Jerdon, T. C., M.D., Madras, India, 1867.

Keech, Alexander, A.F.C., Rappahannock, Virginia, 1816.
Kingsborough, Right Hon. Lord, London, 1837.
King, Henry, M.D., St. Louis, Missouri, 1840.
Kesteloot, Professor, Ghent, 1843.
King, Alfred T., M.D., Greensburg, Pennsylvania, 1844.
Kippist, Richard, London, 1846.
Korthals, P. W., M.D., Leyden, 1847.
Kaup, Professor Jean J., Darmstadt, 1848.
Kirtland, J. P., M.D.. Cleveland, Ohio, 1848.
Kennedy, H. W., M.D., Buenos Ayres, 1852.

Kirkwood, Daniel, Newark, Delaware, 1854.
Krauss, Prof F., Stuttgard, 1859.
Knieskern, P. D., M.D., N. Jersey, 1865.
Kite, Thos., Cincinnati, Ohio, 1865.
Kuster, H. C., Cassel, 1867.

Logan, Algernon Sidney, Germantown, Pennsylvania, 1815.
Le Conte, Louis, 1815.
Lakanal, Count, Paris, 1815.
Lee, Henry, Westmoreland, Virginia, 1816.
Latreille, Pierre Andre, Paris, 1817.
Lefroy, M., Paris, 1817.
Leman, M., Paris, 1817.
L'Herminier, Louis, M.D., Guadaloupe, 1817.
Long, Stephen H., U. S. A., 1817.
Lucas, J. A. H. (fils), Paris, 1817.
Laugier, M., Paris, 1818.
Lamarck, Chev. de, Paris, 1818.
Leach, W. Elford, M.D., London, 1818.
Lawrence, William, M.D., London, 1821.
Leighton, James, M.D., Pittsburg, 1821.
Lovell, Joseph, M.D., U.S.A., Washington, 1823.
Leonhard, Karl Cæsar von, Heidelberg, 1824.
Laporte, J. L., Bordeaux, 1832.
Lesson, R. P., Paris, 1832.
Lyell, Charles, Sir, London, 1832.
Le Beau, Justus, M.D., New Orleans, 1833.
Lobe, M. Guillaume, Havana, Cuba, 1836.
Laporte, Count de Castlenau, Paris, 1837.
Liebig, Justus, M.D., Giessen, Germany, 1840.
Locke, John, M.D., Cincinnati, Ohio, 1841.
Lindley, John, Ph. D., London, 1841.
Longchamps, Ed. de Selys, Liege, 1842.
Lettsom, William G., Mexico, 1843.
Lepsius, Professor Richard, LL.D., Berlin, 1843.
Logan, Sir William E., Montreal, Canada, 1846.
Lawrence, George N., New York, 1847.
Lonsdale, William, London, 1847.
Lacordaire, Th., Liege, 1848.
Lagos, Manuel Fereira, Rio Janeiro, 1849.
Lund, P. W., Denmark, 1849.
Lynch, William F., U.S.N., 1852.
Leconte, John, M.D., Columbia S. C., 1853.
Lewis, James, M.D., Mohawk, N. Y., 1861.
Lachmann, Johannes, Geneva, 1862.
Lyon, Sidney S., Indiana, 1863.
Lesquereux, Leo, Columbus, Ohio, 1865.
Lincecum, Gideon, M.D., Long Point, Texas, 1867.

Magnanos, Julian, M.D., Norfolk, Virginia, 1812.
Mangouri, M., Paris, 1812.
Mercier, M., Paris, 1812.
Montral, Champvert, Guadaloupe, 1812.
Mitchill, Samuel L., LL.D., New York, 1812.
Muhlenberg, Rev. Henry, Lancaster, Pennsylvania, 1812.
Melsheimer, Rev. Frederick Valentin, Hanover, Pennsylvania, 1813.
M'Dowell, Ephraim, M.D., Danville, Kentucky, 1813.
Macnevin, William J., M.D., New York, 1814.
Mott, Valentine, M.D., New York, 1814.
Montgomey, Thomas W., M.D., New York, 1814.
Montgomery, Alexander, M.D., U.S.N., 1814.
Murry, James W., Seville, Spain, 1814.
Macaulay, Patrick, M.D., Baltimore, 1816.
Michaux, F. A., Paris, 1818.
Morinier, Noel de la, Paris, 1819.
Milbert, F., New York, 1821.
Mylius, C., Kronstadt, 1822.
Monger, Johannes, Leipsic, 1822.
Miot, A. F., Comte de Milito, Paris, 1825.
MacCulloch, James, M.D., London, 1829.
Mantell, Gideon A., LL.D., London, 1831.
Macgillivray, William, Edinburgh, 1831.
Martius, Professor C. F. P. von, Munich, Austria, 1832.
Mayer, Professor Hermann von, Frankfort, Germany, 1832
Mitchell, Elisha, Chapel Hill, North Carolina, 1832.
Murchison, Sir Roderick Impey, London, 1832.
Martins, Charles, M.D., Paris, 1833.
Moleon, S. G. V. de, Paris, 1833.
Macfadyn, James, M.D., Kingston, Jamaica, 1835.
MacLeay, William Sharp, London, 1836.
Menke, Charles Theodore, M.D., Pyrmont, Germany, 1837.
Macartney, John P., E.D., City of Mexico, 1838.
McFarland, Rev. James, 1838.
Mather, William W., Ohio, 1838.
Mousson, Albert, Zurich, 1839.
Michener, Ezra, M.D., New Garden, Pennsylvania, 1840.
Markoe, Francis, Washington City, 1841.
Mason, Owen, Providence, Rhode Island, 1841.
Melsheimer, F. E., M.D., York County, Pennsylvania, 1843.
Mighels, J. W., Portland, Maine, 1843.
Morris, Rev. John G., D.D., Baltimore, 1844.
Müller, Professor John, M.D., Berlin, 1845.
Morphett, John, Adelaide, South Australia, 1845.
Michel, Myddleton, M.D., South Carolina, 1849.
Malherbe, Alfred, Metz, France, 1850.
Marsh, Dexter, Greenfield, Massachusetts, 1852.
Maury, M. F., U.S.N., 1852.

Motschulsky, Col. Victor de, St. Petersburg, 1854.
M'Clellan, Capt. George B., U.S.A., 1855.
Meek, F. B., Washington, D. C., 1856.
Müller (von), Baron Joh. Wm., 1856.
Mitchell, Prof. O. M., Cincinnati, Ohio, 1858.
Morse, Edw. S., Portland, Maine, 1859.
Marcou, Prof. Jules, Zurich, 1860.
McCartee, D. B., M.D., China, 1861.
Miles, Professor Manly, Lansing, Mich., 1864.
Maximilian, Prince of Wied, 1864.
Morgan, Lewis H., Rochester, N. Y., 1865.
Manigault, G. E., Charleston, S. C., 1866.
Marsh, O. C., New Haven, Conn., 1867.
Marsh, Geo. P., Florence, Italy, 1867.
Montrouzier, R. P., New Caledonia, 1867.
Morelet, Arthur, Dijon, France, 1867.
Mörch, Prof. O. A. L., Copenhagen, 1867.
Mabille, Jules, Dinon, France, 1867.
Mohrenstein, G. S. Von, Vienna, 1867.

Nuttall, Thomas Sutton, Lancashire, England, 1817.
Norwood, J. G., M.D., Madison, Indiana, 1842.
Nicollet, J. N., Washington, D. C., 1842.
Norman, Benjamin M., New Orleans, 1843.
Nott, Josiah C., M.D., Mobile, Alabama, 1845.
Nicholson, Charles, M.D., Sidney, New South Wales, 1846.
Nilsson, Professor Sv., Lund, Sweden, 1847.
Newberry, J. S., M.D., New York, 1853.
Nordmann, Alexander Von, St. Petersburg, 1854.
Newmann, Johann G., Gorlitz, 1859.
Newton, Alfred, London, 1861.
Newcomb, Wesley, M.D., Oakland, Calif., 1867.

Oemler, Augustus J., Savannah, Georgia 1813.
O'Kelly, Michael J., Dublin, Ireland, 1816.
Olmsted, Denison, New Haven, 1828.
Oakes, William, Ipswich, Massachusetts, 1830.
Owen, Prof. Richard, London, 1834.
Oken, Lorenz, Basle, Switzerland, 1837.
Owen, David Dale, M.D., New Harmony, Indiana, 1840.
Ombrosi, James, Florence, Italy, 1843.
Otis, Geo. A., M.D, U.S.A., Washington, D. C., 1866.
Osten Sacken, Baron R. von, Russian Legation, New York, 1868.

Pierpont, William, Barbadoes, 1812.
Poutrel, Alexander, Guadaloupe, West Indies, 1812.
Perkins, Jacob, Newburyport, Massachusetts, 1813.
Pinel, M., M.D., Paris, 1815.

Palmer, John, Calcutta, 1817.
Parent, M., Paris, 1820.
Poli, Joseph Harrier, M.D., Naples, 1820.
Parkes, Samuel, London, 1821.
Pentland, J. Barclay, London, 1821.
Porter, T. D., M.D., Columbia, South Carolina, 1822.
Prévost, Constant, Paris, 1823.
Pickering, Charles, M.D., Boston, 1826.
Poinsett. Joel R., South Carolina, 1829.
Pitcher, Zina, M.D., Detroit, 1830.
Peter, Robert, M.D., Lexington, Kentucky, 1835.
Piddington, Henry, Calcutta, 1836.
Prinsep, James, Calcutta, 1836.
Parsons, Usher, M.D., Providence, Rhode Island, 1838.
Prichard, James Cowles, M.D., Bristol, England, 1838.
Pouchet, Professor F. A., Rouen, France, 1842.
Phillips, John, York, England, 1843.
Percival, James G., M.D., New Haven, Connecticut, 1843.
Porcher, Francis P., M.D., Charleston, S. C., 1849.
Perley, M. H., St. Johns, New Brunswick, 1852.
Porter, Rev. T. C., Lancaster, Pennsylvania, 1853.
Prout, Hiram A., M.D., St. Louis, 1854.
Pratten, Henry, New Harmony, Indiana, 1854.
Pleasonton, Alfred, U.S.A., 1857.
Pierce, Prof. Benj., Cambridge, Mass., 1858.
Postell, Jas., St. Simons Isle, Georgia, 1859.
Prime, Temple, New York, 1862.
Putnam, F. W., Salem, Mass., 1867.
Pleasants, Henry, Pottsville, Penna., 1867.
Pfeiffer, Louis, M.D., Cassel, 1867.
Petit de la Saussaye, Paris, 1867.
Poey, Prof. F., Havana, 1867.
Philippi, R. A., M.D., Santiago, Chili, 1867.

Quinby, J. B., 1836.

Roxburgh, William, M.D., Calcutta, 1812.
Randall, John, M.D., Boston, 1816.
Risso, J. A., Nice, France, 1818.
Rucco, Julius, M.D., Naples, 1820.
Reinwardt, Prof. C. G. C., Leyden, 1821.
Ricord, Alexandre, Paris, 1823.
Ricord, Phillipe, Paris, 1823.
Ranzani, Camillo, Bologna, 1827.
Rüppel, Edward, M.D., Frankfort, Germany, 1830.
Ravenel, Edmund, M.D., Charleston, South Carolina, 1832.
Rhea, Matthew, Columbia, Tennessee, 1832.
John, M.D., London, 1832.

Riley, William, M.D., Baltimore, 1833.
Rose, Robert H., M.D., Silver Lake, Pennsylvania, 1833.
Rogers, W. B., Virginia, 1834.
Reynolds, Henry S., M.D , U.S.N., 1835.
Reichenbach, Professor H. G. L., Dresden, 1836.
Riddell, John L., M.D., New Orleans, 1836.
Randall, John W., Boston, 1837.
Reynolds, F. N., New York, 1837.
Redfield, William C., New York, 1841.
Reinhardt, J. C., M.D., Brazil, 1845.
Rich, William, Boston, Massachusetts, 1845.
Rathvon, S. S., Lancaster, Pennsylvania, 1845.
Robb, James, Frederickton, New Brunswick, 1846.
Retzius, Professor Andreas, Stockholm, 1846.
Ravenel, Henry W., South Carolina, 1849.
Rio, Prof. Andres del, Mexico, 1849.
Rauch, John H., Burlington, Iowa, 1856.
Rutherford, Lewis M., New York, 1859.
Römer, Prof. Edward von, Marburg, 1859.
Rammelsberg, Prof. C. F., Berlin, 1859.
Römer, Ferdinand, M.D., Bonn, 1859.
Ross, Bernard R., Hudson's Bay Co.'s Service, 1861.
Reeve, Lovell, F.L.S., London, 1862.
Reynolds, Wm. F., U.S.T.E., 1862.
Rémond de Corbineau, Auguste, San Francisco, Cal., 1863.
Roepper, Wm. Theo., Bethlehem, Penna., 1865.
Romanowsky, Lt.-Col. Hennadius, St. Petersburg, 1865.
Raimond, Antonio, M.D., Lima, Peru, 1867.
Recluz, M. C., Paris, 1867.
Reinhardt, Prof. J., Copenhagen, 1867.

Southern, William, M.D., Maryland, 1812.
Silliman, Benjamin, M.D., LL.D., New Haven, 1815.
Scott, Andrew, M.D., Newbern, North Carolina, 1815.
Sims, Howard, Baltimore, Maryland, 1817.
Steinhauer, Rev. Henry, Bethlehem, Pennsylvania.
Schreibers, Charles Von, Vienna, 1818.
Sparrman, Andreas, Univ. Upsal, 1818.
St. Hilaire, Geoffroy, Paris, 1818.
Stevens, Alexander H., M.D., New York, 1819.
Schoolcraft, Henry R., Washington, 1820.
Sealey, James, Cork, Ireland, 1820.
Stemberg, Gaspard, Comte de, Bohemia, 1821.
Schweinitz, Rev. Lewis D. Von, Ph. D., Bethlehem, Pennsylvania, 1822.
Savi, Professor Paolo, Pisa, 1827.
Shepard, Charles U., New Haven, 1828.
Sagra, Ramon de la, Madrid, 1829.

Swainson, William, New Zealand, 1830.
Shannon, John, Beaver, Pennsylvania, 1831.
Short, Charles W., M.D., Lexington, Kentucky, 1831.
Serres, Marcel de, Montpellier, France, 1832.
Styles, John, M.D., New York, 1834.
Saynisch, Lewis, M.D., Tioga, Pennsylvania, 1836.
Schwaegrichen, Professor Fredk., M.D., Leipsic, 1836.
Skinner, Ezekiel, M.D., Liberia, 1837.
Stacey, Col. L. R., Calcutta, 1838.
Storer, D. Humphreys, M.D., Boston, 1839.
Sager, Abram, M.D., Detroit, 1839.
Silliman, Benjamin, Jr., New Haven, 1841.
Saul, James, New Orleans, 1841.
Sowerby, George B., London, 1841.
Stephens, John L. New York, 1843.
Strain, Lt. Isaac G., U.S.N., 1843.
Sedgwick, Rev. Adam, London, 1843.
Sullivant, Wm. S., Ohio, 1844.
Smith, J. Lawrence, Louisville, Kentucky, 1846.
Savage, Rev. Thomas S., M.D., Natchez, 1846.
Smith, Lt.-Col. Charles Hamilton, London, 1846.
Squier, George E., New York, 1847.
Selby, John Prideaux, Northumberland, England, 1847
Sturm, Jacob, M.D., Nuremberg, 1847.
Scoresby, Rev. William, Yorkshire, England, 1848.
Strickland, Hugh E., London, 1848.
Schouw, Professor J. Frederick, Ph. D., Copenhagen, 1848.
Shumard, Benjamin F., M.D., St. Louis, 1848.
Sharpey, William S., London, 1849.
Smith, Robert, St. Thomas, West Indies, 1851.
Smith, J. Brown, California, 1852.
Schaum, H., M.D., Berlin, 1852.
Sauvalle, F. A., Cuba, 1855.
Santos, C. A., Rio de Janeiro, 1855.
Solar, Jose del, Lima, 1855.
Sandberger, Guido, M.D., Wiesbaden, 1855.
Sandberger, Fridolin, M.D., Wiesbaden, 1855.
Suckley, George M.D., New York, 1855.
Steiner, Lewis H., M.D., Frederick, Md., 1855.
Sclater, Philip Lutley, London, 1856.
Spillman, Wm., M.D., Columbus, Miss., 1857.
Sorby, Henry Clifton, Sheffield, Eng., 1858.
Swess, Prof. Edward, Vienna, 1859.
Saussure, Henri de, Geneva, 1859.
Swallow, G. C., St. Louis, Mo., 1859.
Schimper, Prof. W. P., Strasburg, 1859.
Siebold, Carl Theo. von, Munich, 1859.
Smallwood, Prof. Chas., M.D., Montreal, 1860.

Showalter, E. R., M.D., Uniontown, Ala., 1861.
Spach, Prof. Edouard, Paris, 1862.
Stein, Dr. Friedrich, Prague, 1862.
Sheldon, Prof. D. S., Davenport, Iowa, 1862.
Spinner, Hon. F. E., Washington, 1863.
Sowerby, G. B., F.L.S., London, 1865.
Stodder, Chas., Boston, 1865.
Sinclair, Wm., Glasgow, 1866.
Stauffer, Jacob, Lancaster, Penna., 1866.
Scudder, Saml., H., M.D., Boston, Mass., 1867.
Sewer, A. P., Lyons, 1867.
Stearns, R. E. C., San Francisco, Cal., 1867.
Stabile, Abbe Joseph, Milan, 1867.
Souverbie, M., Bordeaux, 1867.
Salvin, Osbert, London, 1867.

Thornton, William, M.D., Washington, 1812.
Tilden, Joseph, Boston, Massachusetts, 1812.
Turner, John, Maryland, 1814.
Travers, John, Jr., Lisbon, 1814.
Thomas, E., Baltimore, 1816.
Trescott, John S., M.D., Charleston, South Carolina, 1818.
Torrey, John, M.D., New York, 1822.
Temminck, Conrad Jacob, Leyden, 1824.
Totten, Jos. G., U.S.A., 1830.
Tait, Charles, Claiborne, Alabama, 1832.
Thompson, Allan, M.D., Edinburgh, 1834.
Traill, Thomas Stewart, M.D., Edinburgh, 1835.
Trimble, James, M.D., Williamsburg, Pennsylvania, 1836.
Trinius, Professor, M.D., St. Petersburg, Russia, 1836.
Tamnau, Professor Frederick, Berlin, 1839.
Twigg, William A., New Harmony, Indiana, 1841.
Tappan, Benjamin, Ohio, 1842.
Taylor, Julius S., M.D., Carrolton, Ohio, 1845.
Tuomey, M., Tuscaloosa, Alabama, 1845.
Tremper, Jacob C., Yates County, New York, 1845.
Tiedmann, Professor F., M.D., Heidelberg, 1848.
Tuckerman, Edward, Cambridge, Massachusetts, 1848.
Thompson, William, Belfast, Ireland, 1848.
Thurber, Geo., New York, 1861.
Thomson, John H., New Bedford, Mass., 1862.
Thackara, J. M. S., Punca, Peru, 1866.
Troschel, Prof. F. H., Bonn, 1867.

Unanué Hippolito, M.D., Lima, Peru, 1821.
Ure, Andrew, M.D., Glasgow, 1829.

Vauquelin, M., Paris, 1818.
Van Hoorebeke, Charles Joseph, Ghent, 1821.
Van Rensselaer, Jeremiah, M.D , New York, 1829.
Voltz, Louis Phillippe, Strasburg, Germany, 1833.
Vargas, Jose Maria, M.D., Caracas, Venezuela, 1835.
Van Rensselaer, Stephen, Albany, New York, 1835.
Vancleve, John, Dayton, Ohio, 1843.
Verneuil, Edward de, Paris, France, 1846.
Verreaux, Jules, Paris, 1848.
Van Beneden, P. J., Bruxelles, 1864.
Vaillant, Leon, M.D., Paris, 1867.

Wallich, Nathaniel, M.D., Calcutta, 1819.
Wetherill, Samuel R., Burlington, New Jersey, 1814.
Webster, John W., M.D., Cambridge, Massachusetts, 1814.
Wheelwright, Joseph, M.D., Kentucky, 1814.
Wister, Charles J., Germantown, Pennsylvania, 1814.
Wray, Thomas J., M.D., Augusta, Georgia, 1818.
Worth, James, Bucks County, Pennsylvania, 1823.
Wiedeman, D. R. G., M.D., Kiel, Germany, 1823.
Ward, Malthus A., M.D., Athens, Georgia, 1832.
Warder, John A., M.D., Cincinnati, Ohio, 1842.
Warren, John C., M.D., Boston, Massachusetts, 1842.
Wyman, Jeffries, M.D., Boston, Massachusetts, 1844.
Wilson, Edward, Pembrokeshire, Wales, 1846.
Wood, W. Maxwell, M.D., U.S.N., 1847.
Waldheim, Fischer, de, Moscow, 1848.
Webber, Samuel, M.D., New Hampshire, 1851.
Whitney, J. D., Boston, 1852.
Wagner, Professor A., Munich, 1852.
Wailes, B. L. C., Washington, Mississippi, 1854.
Winslow, R. K., Cleveland, Ohio, 1854.
Wright, W. W., York Springs, Pa., 1859.
Wynne, James, M.D., New York, 1861.
Woodworth, John M., Chicago, 1861.
Walsh, Benjamin D., Illinois, 1861.
Wisely, J. J., M.D., Sioux Falls, Dacota Territory, 1866.
Willis, John R., Halifax, Nova Scotia, 1867.
Winchell, Alexander, Ann Arbor, Mich., 1867.
Wood, Rev. Alphonso, Brooklyn, N. Y., 1867.

Yarrell, William, London, 1829.

Zollickoffer, William, M.D., Middletown, Maryland, 1834.
Zimmerman, Chr., M.D., Columbia, South Carolina, 1836.
Ziegler, Rev. Daniel, York, Pennsylvania, 1844.
Zuccarini, Professor Joseph G., Munich, Bavaria, 1846.
Zaremba, C. William, St. Joseph's, Mich., 1867.

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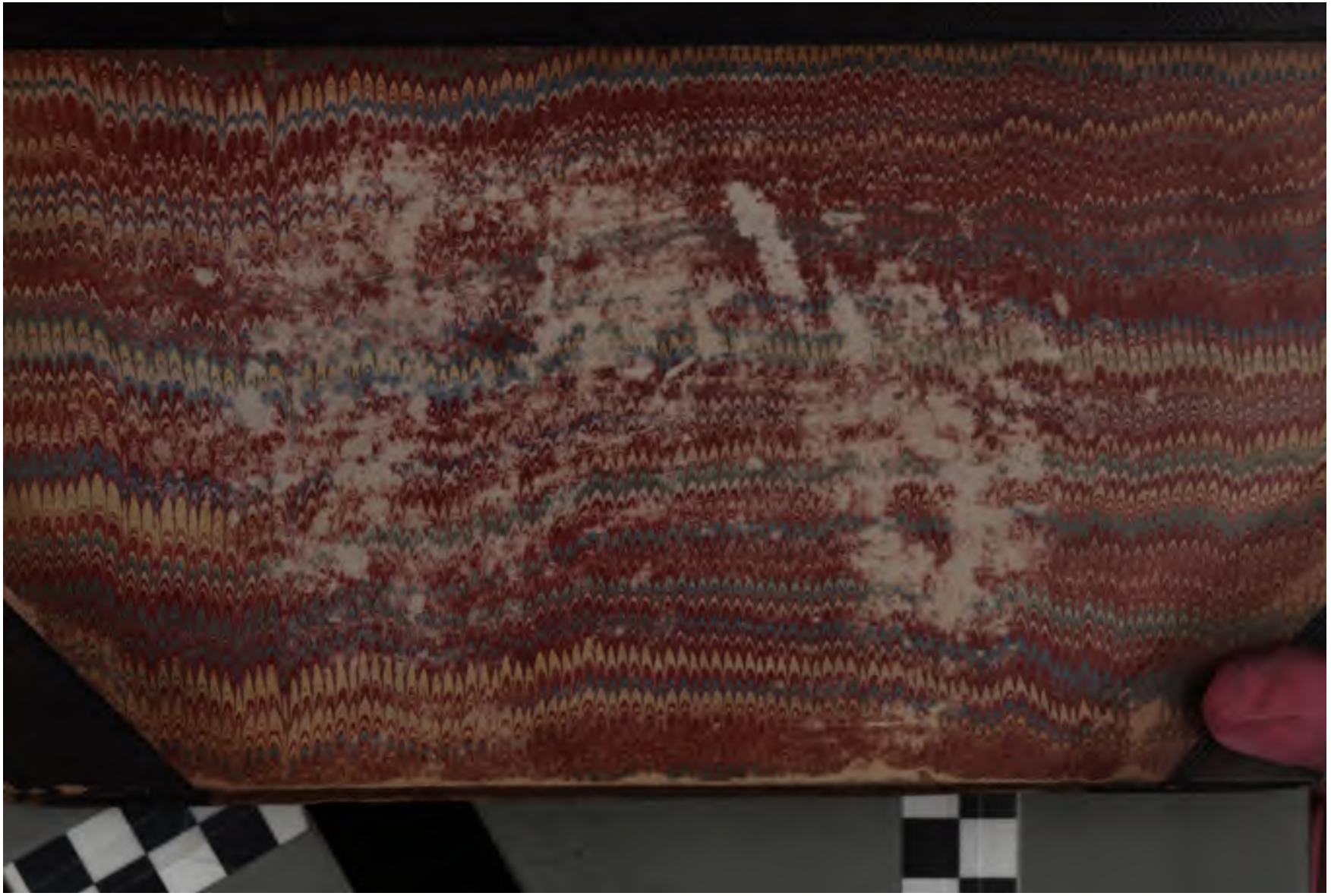
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